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The Brain as the Original Accounting Institution

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ABSTRACT: The evolved brain neuronally processed information on human interaction long before the development of formal accounting institutions. Could the neuronal processes represent the underpinnings of the accounting principles that exist today? This question is pursued several ways: first as an examination of parallel structures that exist between the brain and accounting principles, second as an explanation of why such parallels might exist, and third as an explicit description of a paradigm that shows how the benefits of an accounting procedure can emerge in an experiment.

Keywords: *complexity; trust; reciprocity; neuronal activation.*

I. INTRODUCTION

The discussion[1] centers on coming to understand the brain as the original accounting institution. Although not universally adopted, the idea, still in its infancy, has attracted an encouraging amount of interest from the research community. So that the reader will have a clear grasp of the idea, let me first elaborate the concept. A modicum of self-awareness leads us to acknowledge that the brain keeps track of interactions with others, sometimes noisily—we experience and remember what it was like to buy a recent car, how the transfer of title to our home occurred, and our last trip to the grocery store—and at times, we are surprised that the brain has remembered something on reflection that we had previously forgotten. A crucial point is that with more events and more complex sets of interchanges, the brain is juggling a great many interactions and events, and the argument is that the brain needs help and seeks external procedures for handling events that mimic or complement the way the brain handles them internally. Thus, the overall

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[1] This discussion is drawn from the American Accounting Association (AAA) Presidential Address given in 2007. The AAA convention brought together world-renowned anthropologists, political scientists, and recent Nobel laureates in economics to speak in its plenary sessions. The address was meant to complement several of the themes in other session talks, in particular, discussions of the origin of recordkeeping, as well as outline how accounting played a role in the discovery process, as outlined by Hayek. While the address was delivered singly, a wide set of collaborators contributed their ideas on various dimensions and numerous issues, including Sudipta Basu, Gary Hecht, Radhika Lunawat, Kevin McCabe, Kristy Towry, and Greg Waymire. This address was an early attempt to bring together ideas that are now included in a number of working papers and publications (Basu and Waymire 2006; Basu et al. 2009; Berg et al. 1995; Dickhaut et al. 2009a, 2009b); these works were used liberally to refine the presentation developed here. Special thanks go to the president of the AAA, Shyam Sunder, who not only encouraged this talk, but also stood behind a broad approach to examining accounting issues and their bases at the convention.

Editor's note: This commentary, based on a lecture at the 2007 American Accounting Association Annual Meeting in Chicago, IL, was invited by senior editor Steven Kachelmeier, consistent with the AAA Executive Committee's goal to promote broad dissemination of the AAA Presidential Scholar Lecture.

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proposition is that the brain is the original accounting institution and that society has developed numerous artificial institutions, with properties similar to those of the brain, to address the demands of increasingly complex exchange environments.

Here the concept of *institution* is used in a broad sense, and does not refer to names or buildings, but rather, to collections of rules and norms that organize human interaction (North 2005). These institutions exist to promote and organize exchange. The refined proposition is that norms and rules that promote exchange often have their genesis in the rules by which the brain operates. To illustrate, members of a university faculty work within the confines of the expectations and written rules for performance that exist within the organization.

The presentation comprises two distinct parts. First, Section II elucidates on the relationship between brain processes and accounting procedures. Such a relationship suggests that the movement of process from the brain to an external accounting form may be prompted by the introduction of conditions conducive to triggering the formal processes we see today. The impetus for such an examination arises from the Basu-Waymire (BW) hypothesis (Basu and Waymire 2006), discussed further in Section III, which suggests that the complexity of interactions in society puts demands on the brain, which leads to the generation of recordkeeping, an external (non-brain) form of representation of transaction information. The BW hypothesis thus gives us insight into the critical role that recorded information seems to play in building economies. Section IV then turns toward showing how such a hypothesis has relevance today by explicitly examining the predictive ability of the hypothesis in a laboratory experiment. Through the laboratory demonstration, it is possible to see that economies can become more efficient by the mere presence of accounting procedures. Section V offers conclusions.

II. PARALLELS

Before turning to recordkeeping, four examples are provided that relate brain activity to accounting measurement. The illustration of this translation from brain activity to accounting measurements is, however, not inclusive; many more examples have been recognized, which are elaborated in working papers (Dickhaut et al. 2009a, 2009b). It is possible to understand the entire set of what are traditionally called *accounting principles*, namely, duality, revenue realization, expense matching, objectivity, historical cost, auditing, going concern, unit of measure, materiality, periodicity, consistency, conservatism, and managerial accounting, as having distinct parallels to types of brain behavior. Furthermore, it is possible to view the general infrastructure of accounting, such as the development of enforcement institutions, as having its genesis in brain activity. This examination of brain activity in relation to accounting uses results generated by two neuroscientific methodologies, functional magnetic resonance imaging (fMRI), and single-cell recording. The fMRI technique assesses blood flow in the brain as a proxy for neuronal firing and is the methodology most often used to examine decision-making behavior in humans. Single-cell recording detects directly whether neurons have fired, neuronal firing being a basic component of internal brain communication. These methodologies help establish brain processes that engage in accounting-like activities.

The four examples discussed in the following paragraphs are based on the accounting principles of conservatism, revenue realization, managerial accounting, and duality (or, more specifically, double-entry bookkeeping).

Conservatism

Conservatism had its beginning in the early 15th century, prior to the publication of Pacioli's text on double-entry bookkeeping; it traditionally has been captured by the *lower of cost or market rule*, as represented by the phrase "recognize all losses, but anticipate no gains." Conservatism can be applied to all non-cash assets, but its most frequent application through time has been to inventories. Businesses chose conservative accounting in a time before a centralized authority set formal standards for accounting practices, which suggests that conservatism was derived from repeated transactions and functioned as a norm of behavior among business firms.

Neuroeconomic research suggests a strong pattern of brain behavior consistent with the principle of conservatism: the brain processes gains and losses differently. Knutson et al. (2001) studied the brain activation of subjects exposed to both losses and gains in the subjects' endowments while being scanned. Subjects are more sensitive to gains than to losses in the area known as the mesial prefrontal cortex. Tom et al. (2007) presented subjects with 256 50/50 gambles with gain and loss components and solicited attractiveness ratings on these gambles. Tom and colleagues estimated the degree of gain needed to compensate a unit of loss when subjects evaluated attractiveness of a gamble. They found this ratio to be 1.97, a number consistent with behavioral loss aversion. In their study, specific brain areas, such as the striatum, prefrontal cortex, and anterior cingulate, showed less absolute difference in activation for gains than for losses. This suggests that the ultimate explanation for the conservatism principle may derive from how gains and losses are differentially processed by neurons within the human brain.

Revenue Realization

When person A receives a good from person B in exchange for cash, both sides generally receive a signed receipt. We conclude that person B has earned revenue for the amount paid by person A. Suppose only one side of the transaction were performed: person A could receive a good and sign an agreement to pay person B in the future. Has person B earned revenue? The guiding accounting principle for recognizing revenue by person B is based on the likelihood that person B will receive the future cash payment from person A. When the probability of collection is low, sales revenue is not recognized until cash is collected. In contrast, when the probability of collection is high, revenue is typically recognized at the point of sale. The difference in accounting for revenues is paralleled by the time-series of neuronal activation in the ventral tegmental cortex of a macaque monkey anticipating uncertain rewards (Fiorillo et al. 2003). There is less neuronal firing when the monkey receives an anticipatory stimulus that a low-probability reward will be forthcoming. Neuronal firing in this area occurs later, when the reward is actually received. At the time of stimulus onset, suppose there is a high probability that a reward will be received. In this case, neuronal firing occurs primarily when the stimulus is presented, and limited activation occurs when the reward is actually received. Recognition, in both instances, depends on the likelihood of a reward for the monkey or a cash receipt for the business. In other words, the revenue realization principle is consistent with how the primate brain behaves in evaluating uncertain rewards.

Managerial Accounting

A major element of managerial accounting is the comparison of expected and actual performance. Explicit comparison of expected (i.e., budgeted) to actual outcome goes back to Mesopotamia, ca. 2200 BC; the cuneiform tablets have been discovered that describe budgeted versus actual labor for 37 Sumerian women. In such settings, failure to achieve budget resulted in an obligation, and underproduction could, for example, result in slavery until a debt was repaid (Basu and Waymire 2006).

Similarly, the human brain has been found to have a system called the *actor-critic* system. One part, the actor, generates plans in relation to incoming information in the form of internal neuronal responses to internal signals, which later trigger muscle movements. Once an act is performed, it is then evaluated and referred to theoretically as the critic. O'Doherty et al. (2004) examined the difference between expected and actual performance in the human brain. Participants predicted which of two fractals would generate a reward. The experimenters then identified a portion of the brain responsible for identifying when the prediction failed—the ventral striatum.

Duality

The principle of duality relates to double-entry bookkeeping. It can be argued that one factor contributing to the viability of double-entry bookkeeping is its similarity to how the brain accumulates frequency information when making a decision. Double-entry bookkeeping structures accounts so that dual effects are represented in debits and credits, which reflect either positive or negative changes, depending on whether the account is an asset, a liability, or an equity. Consider a liability account with its debits and credits. In such accounts more credits are accumulated than debits, which is reflected in a positive liability balance at any point in time.

Shadlen and Newsome (2001) isolated a similar counting device in the brain of the macaque monkey using single-cell recording. In that study, the monkey observed a screen with dots moving right and left across the field. Some dots (e.g., the ones moving right) exceeded in number the other dots (e.g., those moving left). The monkey was rewarded when it made an eye movement toward the direction in which more dots were moving. In the performance of such a task, the monkey recorded (in the form of neuronal activation) the net movement of all dots (left or right) and registered the accumulated difference between the two at any point in time in the lateral intraparietal sulcus.

Both types of movement (right and left) are reflected in positive amounts (like credits and debits), and the difference is registered as a positive account balance of the net movement in a particular direction. If this difference reaches a critical level, a message is sent to the monkey's motor system, and a movement is made, indicating a choice. The monkey's brain uses the amounts in these accounts as decision variables that trigger an action, much like typical accounting balances are used to assess if loan provisions are not satisfied.

III. BEYOND PARALLELS

On the basis of these parallels between brain function and accounting principles, one could ask, is there a natural phenomenon that mediates these parallel relationships? By focusing on a very specific accounting practice—recordkeeping—Basu and Waymire (2006) have outlined an explanation regarding why we see accounting processes emerge. They argue first that what distinguishes the performance of human civilization is the ability to coordinate activity, through trust and reciprocity, with other human beings. For small groups of individuals, such coordination relies on the brain's memory of characteristics of transactions a person had with another in the past, such as the quality of the good exchanged, the ability to repay, and one's reputation with others, emergent through word of mouth. Basu and Waymire's (2006) basic proposition is that as society became more complex, through the growing number of possible exchange partners, the increasing diversity of goods, and the ability to store goods for greater lengths of time, the brain's ability to remember such complexity was challenged, and at that point, civilizations turned toward external recordkeeping devices. (Devices for recordkeeping existed even before the existence of a written language.)

Artifacts provide some evidence for this assertion. Tokens that were found among the ruins of a Sumerian civilization dated to around 8000 BC. Originally, some believed that such tokens were monetary or religious symbols, but they have come to be understood as counters. For example, a round sphere represented a particular type of commodity, such as a goat, while the triangular disk represented another commodity, such as a sheep. When the owner of a herd gave the herd to a shepherd, a tally was made of the numbers in the herd so that at the end of the time during which the shepherd was responsible for the flock, an assessment could be made of how well the animals were tended, which enabled the owner of the herd to decide if he wanted to hire the same shepherd again the next season. Similarly, the tokens could be used for agricultural products. Basu and Waymire (2006) argue that the ability to keep such records led naturally to the ability to assess trustworthiness and greatly extended commerce and the division of labor that developed in these societies. They further argue that such augmentation in small-scale societies is a necessary part of what allows large economies to function today.

The extension of the BW hypothesis in relation to other accounting principles is that accounting principles have arisen from the same force of increased complexity, except in the economic environment. The brain repeatedly faced the same type of transaction many times, and via the repetition of conditions and the high number of interactions, the brain becomes challenged and looks to some form of external representation to take the place of its internal functions.

The BW hypothesis also suggests a new kind of experimental paradigm, which, in particular, shows how the hypothesis works and demonstrates that it leads to the kinds of benefits outlined by Basu and Waymire (2006).

IV. AN APPRAISAL OF THE BASU-WAYMIRE HYPOTHESIS IN AN EXPERIMENTAL ENVIRONMENT

Here only one procedure is examined experimentally, namely, the recordkeeping hypothesis of Basu and Waymire (2006).[2] What we want to do is show that this historical role of complexity still has meaning in today's world. Thus, we expect that in an environment in which trust and reciprocity are feasible, actors will choose to rely more on records to facilitate trust and reciprocity as the environment becomes more complex, and that this recordkeeping ability will result in marked performance improvements for the economy under discussion.

To facilitate this discussion, it is first necessary to explore how it is possible to study trust and reciprocity experimentally. Then, economies of low and high complexity that can be studied in the laboratory are developed and described. If the BW hypothesis is correct, then we should see increased trust and reciprocity as well as improved economic performance in the complex environment when recordkeeping is possible. Such a result will constitute an important step forward in the research program on recordkeeping.[3]

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[2] In principle, an examination of all possible parallels outlined earlier would be optimal, but a full methodology for such a study is still under development.

[3] Step 2 (which is currently under way) asks if regions of the brain perform differentially under recordkeeping versus no recordkeeping and examines changes in brain function when levels of complexity are altered.

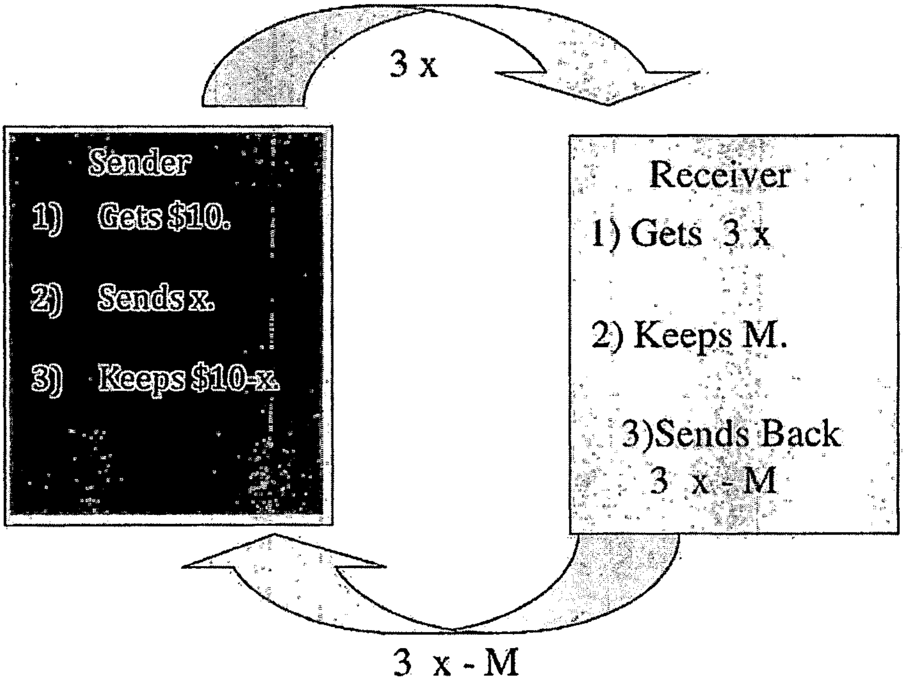
Studying Trust in the Laboratory

The basic experimental study of trust derives from an investment game developed by Berg et al. (1995). The base game has a sender and a receiver (Figure 1). The sender receives ten monetary units (usually dollars). The sender can send some, none, or all to the receiver in whole dollars. On the way to the receiver, the amount triples. The receiver then can take some, none, or all of the amount received and send the remainder back to the sender. This is a game of trust in the sense that the sender has explicitly put money at risk. The receiver is said to reciprocate the behavior of the sender: the receiver can negatively or positively reciprocate. This game is called the one-shot, two-person investment game. When the game is over, both parties leave the premises independently.

Self-interest on the part of both parties dictates that the second party, on receiving something, will send back nothing, and that the first party, knowing what the second party will do, will send nothing. However, results of the game hardly manifest the predictions based on self-interest.

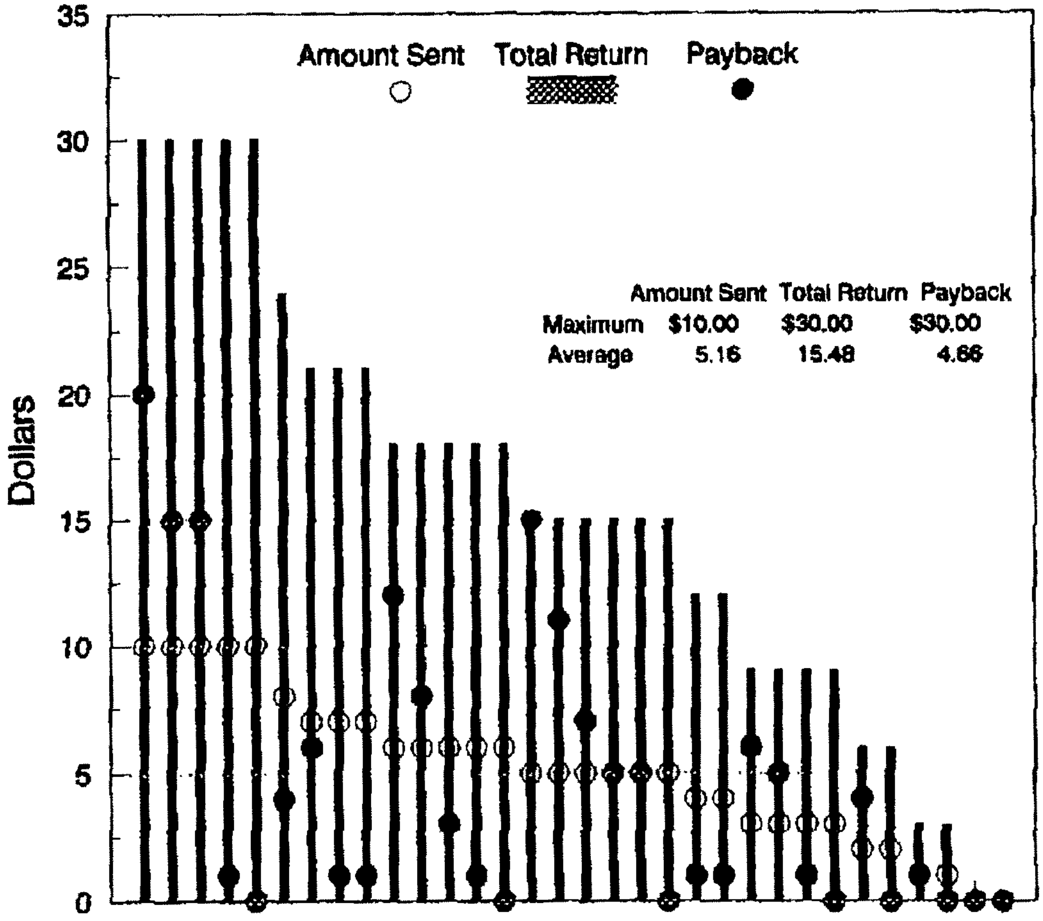
Thirty-two pairs of senders and receivers participated in the Berg et al. (1995) experiment. On the horizontal axis of Figure 2, each mark represents an amount invested by the sender. The amount sent is represented by a white disk for each sender, while the top of

FIGURE 1
Basic Investment Game



This figure depicts the basic investment game of Berg et al. (1995). Player A gets $10, of which X can be taken and the rest is sent to Player B. On the way to Player B the amount is tripled. Player B can take out M of the tripled amount and send back the remainder. This is referred to as the one-shot investment game.

FIGURE 2
Results from Berg et al. (1995)



The figure reproduces Figure 2 of Berg et al. (1995, 130), depicting results from the first run of the basic investment game. There were 32 pairs. Each vertical line represents a particular pair. On that vertical line the white disks represent the amount sent. The top of the line represents the tripled amount and the black disks represent the amount returned. Note that black disks above the white disks indicate a positive return and black disks below the white disks indicate a negative return.

each vertical line represents the tripled amount, and the black disk represents the amount returned by the receiver for each amount sent.

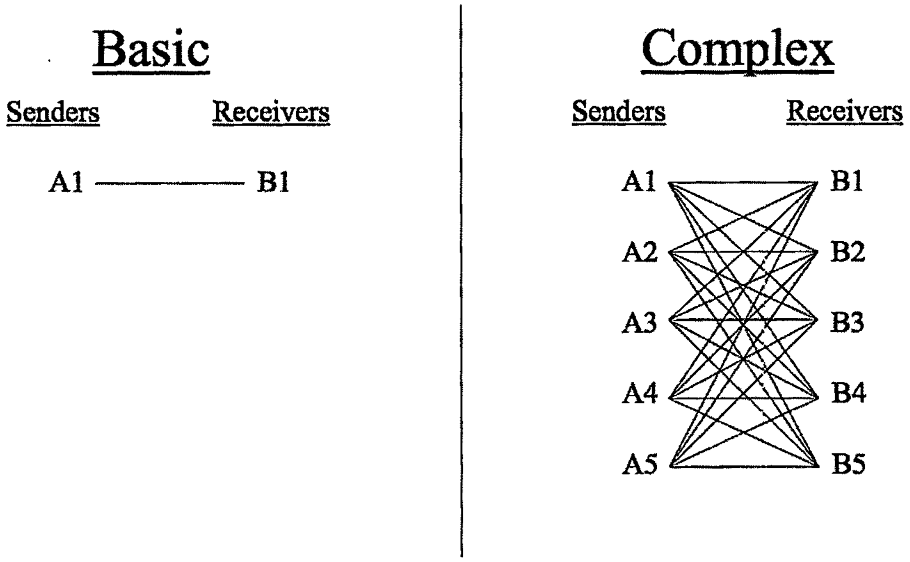
There are some interesting results in this setting. Sender 5 sent all ten units and received nothing back. On the other hand, sender 15 sent five units and received back the entire tripled amount of 15. There is a large amount of variability in the amounts sent and returned. In this particular setting, it is important to take note of the amount of variability conditional on the amount sent. Note the high degree of variability in the amount returned for a particular amount sent, as indicated by black disks often appearing both above and below the white disks on different vertical lines for the same amount sent.

Improving on Outcomes in the One-Shot Investment Game

To bring accounting into this framework, the investment game is expanded on two dimensions, the repetitions of plays between the same two parties, and the number of different parties with whom the same person interacts. Increasing the number of repetitions between two parties allows the individuals to build a reputation with each other so that on later interactions they can make decisions on investment and reciprocity based on previous experience with the same player. If only repetitions were involved the ability to keep track of interactions from one play to another would be rather straightforward. On the other hand, increasing the number of parties for each person means that there are an increased number of interactions to track, producing the complexity of the BW hypothesis.

Basu et al. (2009) provide such an experimental comparison. Figure 3 contrasts the interactions between subjects in a single-dyad trust game (Figure 3, left) with interactions in a multi-dyad trust game (Figure 3, right). In the multi-dyad trust game, five subjects play the role of investor and five play the role of trustee. In each period, every investor has five separate endowments, one for each trustee. Each investor can send a different amount to different trustees. Therefore each trustee receives five tripled amounts, one from each of the five investors. Every trustee then decides, for each investor, how much of the amount received to send back.

FIGURE 3
Single-Dyad and Multi-Dyad Trust Games



This figure depicts the experimental design of Basu et al. (2009). The basic panel shows the simple single-dyad investment game. It was repeated ten times for 25 dyads for recordkeeping and non-recordkeeping settings. The complex panel shows the multi-dyad investment game. In a single period each sender is associated with five different receivers and *vice versa*. There are five recordkeeping sessions and five non-recordkeeping sessions, each repeated ten times.

The multi-dyad repeated trust game was run for two economies: one in which subjects could keep records and one in which recordkeeping was not possible. Both economies were conducted using the computer software z-Tree (Fischbacher 1999), the windows of which were displayed on the left-hand side of each subject's computer screen. A window for possible typing was on the right-hand side of the computer screen in the recordkeeping economy. Participants were told that they could type anything they wanted. Not all kept records.[4]

Recordkeeping allows subjects to better remember past interactions when exchanging with multiple partners. This experimental procedure examined whether recordkeeping would allow a trustee to establish a reputation because investors could better remember each trustee's actions. Consequently, Basu et al. (2009) predicted that investors would trust partners who have previously provided favorable returns and would commit more resources to exchange with those partners. As a result of such mediated interaction, the history of consummated exchange in an economy will evolve differently when agents can keep records.

Investor trust was higher when records were kept; that is, investors committed to maximum investment more often in the recordkeeping economy. A total of 430 maximum investments (investments of ten) were made by investors in the recordkeeping economy, and only 210 investments were made in the non-recordkeeping economy.

Trustees in a recordkeeping economy are more likely to reciprocate investor trust by making so-called fair return decisions. A fair return decision is one in which the trustee evenly splits the amount received with the investor. Fair choices are more likely to come from the recordkeeping setting. Thus, recordkeeping leads to greater investor trust and trustee reciprocity.

Significant differences in performance were observed between Basu et al. (2009) recordkeeping and non-recordkeeping laboratory economies. The experimenters measured a given dyad's performance as the difference between a dyad's total payoff and the minimum possible payoff as a percentage of the maximum possible difference that could occur. Dyads in the recordkeeping economy showed greater average gains from exchange (56.5 percent of the maximum possible) than dyads in the non-recordkeeping economy (49.9 percent of the maximum possible). Economic agents can better track cooperation among multiple trading partners over time, which leads to a significant improvement in overall economic performance. In addition, Basu et al. (2009) find that the returns are higher and the risks are lower per dyad in recordkeeping economies, and the inter-correlations between amounts sent in period 10 and amounts returned in earlier periods are much higher for the recordkeeping setting.

The findings offer direct causal support for the hypothesis suggested by the archeological record that basic technologies for storing transactional data through symbolic artifacts, and subsequently through writing, favorably influence trust and reciprocity in exchange and alter fundamentally the history of an economy's development. These findings complement work suggesting that economic institutions play a central role in sustaining the extraordinary level of cooperation that characterizes human behavior relative to other species. Future experiments will consider the joint effect of recordkeeping, communication, and sanctioning institutions. The results also portray a theme outlined by Waymire (2009) that accounting plays a fundamental role in guiding the profit-making decisions of the firm.

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[4] Some, in fact, wrote poetry.

V. CONCLUSION

Let me conclude by summarizing the broad, basic points of this discussion. The brain processes information, and several information-processing systems of the brain are mimicked in existing accounting systems. I, then, turned to why such parallels have come to exist. The basis for the observation is the Basu and Waymire (2006) hypothesis, which suggests that observed accounting is a consequence of increased complexity in the environment. I then turned directly to the question of whether increased complexity today has the same force it apparently did in antiquity, based on the archeological record, and this discussion has suggested that, in fact, it does. To further substantiate the hypothesis, work is now being undertaken with fMRI to examine the behavior of subjects when they are moved from simple to complex environments and how a brain behaves in investment settings when recordkeeping is present versus when it is not.

The overall results are encouraging. At the same time, the infancy of the approach needs to be emphasized, as does the fact that progress is slow going. It will no doubt be more challenging to see if such processes as the lower of cost or market rule and revenue realization can arise in the laboratory and, if they can, what the corresponding brain behavior will be.

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Capital Market Prices, Management Forecasts, and Earnings Management

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ABSTRACT: I analyze a manager's optimal earnings forecasting strategy and optimal earnings management policy in a setting where both the mean and the variance of the distribution generating the firm's cash flows are unknown. The analysis shows that the equilibrium price of the firm is a function of the manager's forecast, the firm's reported earnings, and the squared error in the manager's earnings forecast. The model contains several predictions, including: (1) the manager manipulates earnings to reduce his forecast error at the earnings announcement date; (2) the firm's stock price is more sensitive to the firm's actual earnings announcement than to the manager's forecast; and (3) controlling for the level of reported earnings and the magnitude of the earnings surprise, the firm's price is higher when it has a positive surprise at the earnings announcement date than when it has a negative surprise.

Keywords: *management earnings forecasts; earnings management; capital market prices.*

I. INTRODUCTION

The goal of this analysis is to model managers' propensity to bias their forecasts and manipulate earnings, and to evaluate the capital market's equilibrium reactions to management forecasts and earnings releases. I contrast the predictions of the model with empirical results on management forecasts and earnings management. Many of the predictions of the model are consistent with established empirical findings. For example, the model provides one potential explanation for why managers care about the error in their earnings forecasts and why capital markets value firms with positive earnings surprises at a premium even after controlling for the level of reported earnings.

Unlike most analytical models of earnings management, the model assumes that investors are uncertain about the process generating both the mean and the variance of the firm's

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(present value of) cash flows.[1] This seems to be the realistic case; in practice, investors are uncertain about many aspects of the distribution of a firm's cash flows.[2] In the model, their knowledge of both the mean and variance of this distribution is affected by the firm's management's earnings forecast and the firm's earnings report. Since investors use the information they receive about the firm's earnings to update their beliefs about the unknown mean and variance of cash flows, the manager has incentives to manipulate his earnings forecast and earnings report so that investors perceive the firm's expected cash flows to be high and the variance of cash flows to be low.

The model has five main predictions. First, it predicts that the relation between reported earnings and equity prices is nonlinear.[3] The firm's market price is demonstrated to be a function of the manager's forecast, the actual earnings report, and the squared management earnings forecast error. The market price decreases in the absolute value of the manager's forecast error because investors perceive the firm's cash flows to be riskier if the manager's forecast error is large in magnitude. The weight investors attach to the manager's forecast error in the pricing function decreases in their risk-aversion.

Second, the manager manipulates earnings to reduce the earnings surprise, that is, his forecast error, at the earnings announcement date. The less persistent the firm's cash flows, the stronger is the manager's incentive to reduce his forecast error. When managers adhere to this equilibrium reporting strategy, the capital market values firms with positive earnings surprises at a premium. That is, controlling for the level of reported earnings and the magnitude of the earnings surprise, firms with earnings exceeding their forecast will enjoy a higher capital market valuation than firms that disappoint investors by reporting earnings below their forecast.

Third, the model predicts that the manager biases his forecast downward such that the average forecast error (measured as the difference between reported earnings and the manager's forecast) is positive. The capital market induces the manager to issue a forecast that he is likely to beat, that is, a "pessimistic" forecast, because the market values firms whose reported earnings exceed their managers' forecasts at a premium compared to firms whose reported earnings fall short of their managers' forecasts.

Fourth, the model predicts that the sensitivity of a firm's stock price to the earnings forecast is smaller than to the actual earnings announcement and that the difference between those two response coefficients varies systematically with the persistence of cash flows. It is intuitive that investors are more sensitive to earnings reports than to earnings forecasts, given the manager's tendency to reduce earnings surprises at the earnings announcement date by manipulating earnings appropriately. It is also intuitive that the higher the persistence of cash flows, the stronger stock prices react to inferred first period cash flows at both the forecast release date and the earnings announcement date. Anticipating the manager's propensity to reduce his forecast error, investors rationally revise their beliefs about expected cash flows more if cash flows are less persistent. Together, this reasoning implies that the difference between the stock price response coefficient at the earnings announcement date and the stock price response coefficient at the forecast release date is increasing in the persistence parameter when the persistence of cash flows is either negative or slightly positive, and is decreasing in the persistence parameter for large positive values of persistence.

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[1] Most analytical models assume that means of distributions are unknown but variances are known. Exceptions are Subramanyam (1996), Penno (1996), and Kirschenheiter and Melumad (2002).

[2] "Cash flows," as referred to here and throughout the paper, is shorthand for the present value of future cash flows.

[3] While this paper focuses on the effect of unknown precision on the earnings-return relation, other factors may also cause the earnings-return relation to be nonlinear. For instance, nonlinearity of the relation between price and earnings may be due to the nonsustainability of negative earnings (Hayn 1995) or to investors' limited liability (Fischer and Verrecchia 1997).

Finally, the model predicts that the expected stock price reaction to earnings surprises increases as the cost to the manager of manipulating earnings declines. This finding initially seems counterintuitive. It becomes intuitive once one recognizes that by lowering the cost of earnings manipulation, the manager increases the amount he will understate the surprise at the earnings announcement date. The latter follows because of his incentives to manipulate reported earnings so that investors perceive the variance of cash flows to be low.

Empirical evidence is consistent with several of the model's predictions. For instance, the prediction that capital markets value firms with positive earnings surprises at a premium even after controlling for the level of reported earnings is broadly consistent with evidence provided in Soffer et al. (2000). Soffer et al. (2000) show that, controlling for the combined news released at the earnings preannouncement and announcement dates, the total excess return over the time period that contains both the earnings preannouncement and the earnings announcement is higher for firms that have a positive surprise at the earnings announcement. In a related experimental study, Tan et al. (2002) analyze how analysts react to firms' earnings preannouncement strategies. Similar to the results in Soffer et al. (2000), they find that lower earnings preannouncements lead to higher forecasts after the earnings announcement date. That is, holding reported earnings news constant, Tan et al. (2002) find that analysts' forecasts of earnings increase when the earnings preannouncement understates the amount of positive news and exaggerates the amount of negative news. To the extent that analyst forecasts are related to market values, the experimental findings in Tan et al. (2002) support the prediction of the model that investors value firms with positive surprises at a premium.

Another prediction of the model that has been confirmed empirically is that capital markets "place more weight" on news at the earnings announcement date (as measured by the price response coefficient) than on news at the forecast release date. Pownall et al. (1993) shows that the mean and median stock price response coefficients are larger at the earnings announcement date than at the forecast release date, consistent with the model's predictions. A possible explanation for the different stock price response coefficients is that earnings affect investors' beliefs to a greater extent than forecasts because earnings are a more precise signal of future cash flows than forecasts. The model presented here puts forward an alternative explanation for this difference in stock price response coefficients. Since the manager attempts to reduce his forecast error by manipulating earnings, investors are highly sensitive to any earnings surprise at the announcement date. Also, consistent with the model's predictions that managers care about their forecast errors, Kasznik (1999) finds that managers manipulate earnings upward by taking positive discretionary accruals if reported earnings fall short of their own forecast.

All of the model's predictions discussed above arise as a direct consequence of investors' uncertainty about the variance of the firm's cash flows. If one were to change the model so that investors knew the variance of cash flows, the predictions of the model would change significantly. In that case, the model would predict that (1) the manager would *not* manipulate earnings to reduce his forecast error at the earnings announcement date, (2) the firm's stock price would be *as* sensitive to the firm's actual earnings announcement as to the manager's forecast, and (3) controlling for the level of reported earnings and the magnitude of the earnings surprise, the firm's price would *not* be higher when it has a positive surprise at the earnings announcement date than when it has a negative surprise. This highlights the importance of taking into account that the variance of cash flows is unknown to investors.[4] The paper contributes to the literature on corporate earnings forecasts and reports by deriving their equilibrium properties in a parsimonious model where the variance of cash flows is unknown to investors.

Some recent papers model the effect of unknown precision on reporting and capital market prices. Jorgensen and Kirschenheiter (2003) derive managers' equilibrium strategies for voluntarily disclosing information about the risk of the firm's future cash flows in a setting where the manager privately learns the idiosyncratic variance of the firm's cash flows and can disclose his private information at a fixed cost. Hughes and Pae (2004) consider a manager who privately learns the precision of a signal of the firm's liquidating value and then chooses whether to disclose that precision. Hughes and Pae (2004) show that the manager discloses the precision if the precision is high (low) and the signal lies above (below) prior expectations. A distinguishing feature of the present model is that the manager does not directly disclose the variance of the firm's cash flows (the manager might not know the precision himself). Instead, the manager issues an earnings forecast and report and investors use this information to draw inferences about the variance of the firm's cash flows. In practice, corporate earnings disclosures do not state explicitly higher moments such as the precision of a signal or the variance of a distribution. Instead, investors observe the earnings realization or a forecast of that realization and, based on these observations, draw inferences about all relevant aspects of future cash flows. This analysis attempts to capture such an updating process that includes both mean and variance. It derives predictions about managers' propensity to bias their forecasts and manipulate earnings, and about the capital market's equilibrium reactions to management forecasts and earnings releases. The model shows that taking into account that the variance of cash flows is unknown to investors significantly affects the equilibrium properties of management forecasts, earnings reports, and stock prices. For example, the model predicts that managers manipulate earnings to reduce their own forecast errors, consistent with empirical findings (e.g., Kasznik 1999). Considering the variance of cash flows as unknown to investors might therefore lead to a better understanding of managers' disclosure strategies and stock market reactions.

There exist some models in which investors learn about a precision or variance from an earnings report in a way similar to investors' updating process modeled in this paper. In Subramanyam (1996), the precision of a signal about firm value obtained by the capital market is uncertain resulting in a nonlinear relation between the signal (e.g., reported earnings) and stock returns. Subramanyam (1996) shows that returns are an "S-shaped" function of reported earnings, consistent with the nonlinear earnings-returns relation documented in Freeman and Tse (1992). Kirschenheiter and Melumad (2002) extend Subramanyam (1996) by giving the manager some discretion in reporting his firm's earnings. They show that both income-smoothing and "big bath" behavior characterize the manager's reporting strategy in equilibrium. In Penno (1996), management privately chooses the precision of a signal in a model where the management receives two signals about the firm's liquidating dividend. Penno (1996) shows that management's preferred precision for the second signal depends on the realization of the first signal and that there are equilibria in which investors successfully infer management's precision choice based on the realized value of the first signal. In contrast to these three models, this model assumes that the variance (or riskiness) of the underlying cash flow distribution is unknown to investors rather than the precision of the management's signal. Clearly, management's incentives differ significantly depending on which variance or precision is unknown to investors. As a result, this analysis presents equilibrium properties of management forecasts, earnings reports, and stock prices that are new to the literature. However, the most realistic scenario seems to be that investors are uncertain about not only the variance of the firm's cash flow, but also the precision of the manager's signal. Such a model would combine the economic forces captured in this analysis with those captured in Subramanyam (1996), Kirschenheiter and Melumad (2002), and Penno (1996). This case is not addressed here but might provide an avenue for future research.

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[4] This can be seen by taking investors' beliefs about the variance of the firm's cash flows to the limit where investors know the variance as explained later.

The model is presented in Section II. Section III describes the equilibrium forecasting, reporting, and pricing rules. Sections IV and V describe additional characteristics of the manager's optimal forecasting and reporting strategies, as well as the resulting stock price reaction and contrast the predictions of the model with existing empirical evidence. Section VI concludes. The Appendix contains all proofs.

II. MODEL

This section outlines a parsimonious model of management forecasts and reported earnings when both the mean and the variance of the firm's cash flows are unknown. The sequence of events is the following. The firm's production technology generates stochastic cash flows over two periods.[5] The realized values of these cash flows are not directly observable to anybody outside the firm. However, the initial owner-manager obtains private information about the firm's first period cash flows that he may reveal to future investors by means of initially issuing an earnings forecast and subsequently reporting the firm's earnings. The manager's incentives to distort his forecast and reported earnings are linked through his attempt to maximize the firm's selling price net of his personal cost of forecast and earnings manipulation. At the end of the first period, the initial owner-manager sells the firm to outside investors. His motivation to sell the firm is taken to be exogenous.[6]

During the first period, the manager privately observes the expected value, μ_1, of the firm's first period cash flows. Based on the signal μ_1, he issues a forecast, MF, of first period earnings. He then privately learns the realization of the first period's cash flows, x_1, and reports earnings at the end of the period. In both cases, the manager is not confined to tell the truth and may issue a forecast or report that differs from his private information about the firm's cash flows. However, if he does so, he incurs a personal cost. As is standard in the costly state falsification literature, the manager's cost is a function of the true value and the reported value (e.g., Lacker and Weinberg 1989; Stein 1989). The manager's personal cost of issuing a forecast that deviates from the observed signal, μ_1, is $\frac{c_1}{2}(MF - \mu_1 - \varepsilon_{\mu 1})^2$, where c_1 is a positive constant. Similarly, if the manager issues an earnings report,

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[5] The stochastic cash flows generated by the firm's production technology in the two periods need not be realized over just these two periods. Rather, the cash flows might occur in future periods even though they are attributable to the firm's activities in the first and second periods. For simplicity, I assume that the discount rate is zero and I refer to the present value of cash flows attributable to the firm's first and second period activities as "first period cash flows" and "second period cash flows," respectively.

The present value of cash flows in a period can also be viewed as the unmanaged economic earnings of that period. It is common in the literature to assume that unmanaged earnings are priced by the capital market; see, for example, Dye (1988), Fischer and Verrecchia (1997) and Sankar and Subramanyam (2001).

[6] The model does not rely on the manager selling the whole company. All that is needed for the results of the model to hold is that the manager's utility is linearly increasing in the stock price at the end of the first period. In addition, the manager might sell some of his shares at an intermediate date after he issued the forecast. As long as the fraction of shares that he sells at the intermediate date is less than $\frac{k_1 - k_2}{1 + k_1}$, the model's predictions do not qualitatively change.

R, then he incurs manipulation costs of $\frac{c_2}{2}(R - x_1 - \varepsilon_{x1})^2$, where $x_1 = \mu_1 + \upsilon_1$ and $\varepsilon_{x1} = \varepsilon_{\mu 1} + \varepsilon_{\upsilon 1}$. In addition to the difference between true and reported value, the manager's costs of manipulating the earnings forecast and reported earnings are also affected by the noise terms, $\varepsilon_{\mu 1}$ and $\varepsilon_{\upsilon 1}$. Both noise terms are unobservable to investors and reflect idiosyncratic circumstances. In equilibrium, the noise terms prevent investors from perfectly inferring the firm's first period cash flows by observing the manager's forecast and earnings report. This attempts to capture that, in practice, capital markets may not have the ability to make perfect inferences about a manager's private information regarding the performance of a company. Formally, the noise terms result in the vector (R, MF) not being informationally equivalent to the manager's private information (μ_1, x_1).[7]

The second generation of shareholders who buy the firm at the end of the first period are entitled to the cash flows from both periods, $\tilde{x}_1$ and $\tilde{x}_2$. The selling price of the firm is the expected value of the sum of $\tilde{x}_1 + \tilde{x}_2$, adjusted for a risk-premium factor. That is, given the public information set Ω, the selling price of the firm is $P(\Omega) = E[\tilde{x}_1 + \tilde{x}_2|\Omega] - \gamma Var[\tilde{x}_1 + \tilde{x}_2|\Omega]$, where the parameter $\gamma > 0$ determines the magnitude of the risk-premium.[8] The parameter γ captures investors' mean-variance trade-off and can be viewed as a measure of investors' risk-aversion.

The firm's first and second period cash flows, $\tilde{x}_1$ and $\tilde{x}_2$, are distributed normally with mean $\tilde{\mu}_1$ and $\tilde{\mu}_2$, respectively. The precision (inverse of variance) of $\tilde{x}_1$ given μ_1 is denoted by $\tilde{\tau}$. Second period cash flows, $\tilde{x}_2$, have the same precision as $\tilde{x}_1$. The mean parameters in both periods, $\tilde{\mu}_1$ and $\tilde{\mu}_2$, are normally distributed random variables themselves. Let $\overline{\mu}$ and σ^2_μ denote the expected value and variance of $\overline{\mu}_n$, $n = 1, 2$. The persistence parameter ρ links both realized and expected cash flows over time. That is, $\rho = corr(\tilde{\mu}_1, \tilde{\mu}_2) = corr(\tilde{x}_1, \tilde{x}_2)$. The persistence parameter ρ is a known constant, $\rho \in (-1, 1)$, and captures to what extent first period cash flows predict the level of second period cash flows. In the special case of $\rho = 0$, the cash flows $\tilde{x}_1$ and $\tilde{x}_2$ are independent random variables, and cash flow innovations are transitory. The noise terms, $\varepsilon_{\mu 1}$ and $\varepsilon_{\upsilon 1}$, are distributed normally with mean zero and variance $k_1 Var(\tilde{\mu}_1)$ and $k_2 Var(\tilde{\upsilon}_1) = \frac{k_2}{\tau}$, respectively, and are distributed independent of each other as well as all other random variables in the model.[9]

Note that, while the extent to which second period cash flows reflect the level of first period cash flows may vary with the persistence parameter ρ, the precision $\tilde{\tau}$ stays the same though unobservable for both periods. The precision $\tilde{\tau}$ may stay constant over time because the variability of cash flows is an inherent characteristic of a firm's production technology and/or market situation and those conditions do not change from one period to the next. The prior distribution of $\tilde{\tau}$ is $g(\tilde{\tau})$ where $g(\cdot)$ denotes a gamma distribution with shape-parameter $\alpha > 1$, scale-parameter $\beta > 0$, and location parameter zero.[10] Moreover, the precision, $\tilde{\tau}$, is distributed independently of all other random variables of the model.

All parameters of the model (α, β, γ, ρ, c_1, c_2, k_1, k_2, $\overline{\mu}$, and σ^2_μ) as well as the sequence of events are common knowledge while the manager privately observes the realizations of the random variables $\tilde{\mu}_1$, $\tilde{\varepsilon}_{1\mu}$, $\tilde{x}_1$, and $\tilde{\varepsilon}_{1x}$. While the model is developed as if the manager has no private information about the precision of the firm's cash flows beyond what he can infer from (μ_1, x_1), it would not make a difference to the equilibrium and subsequent analysis if the manager received private information about the precision of the firm's cash flows.[11] Figure 1 summarizes the sequence of events in the model. The beginning of the first period is labeled $t = 0$, the time when the manager issues his forecast during the first period is $t = 1$, and the end of the first period when the manager reports earnings is $t = 2$.

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[7] Fischer and Verrecchia (2000) introduce an unknown parameter in the manager's objective function to avoid full revelation of the manager's private information in equilibrium. The particular approach of introducing noise into the cost function used in this model has been used by Dye and Sridhar (2004).

[8] Verrecchia (1983) and Melumad et al. (1999) make similar assumptions about firms' stock prices.

[9] The Appendix summarizes the specification of the distributional assumptions.

[10] The density $g(\tau)$ is given by $g(\tau) = \frac{\tau^{\alpha-1}\exp(-\beta\tau)}{\beta^{-\alpha}\Gamma(\alpha)}$, where $\Gamma(\cdot)$ denotes the complete gamma function.

The manager's forecasting and reporting rules denoted $MF(\cdot)$ and $R(\cdot)$, respectively maximize the expected price of the firm at the end of the first period net of the manager's cost from manipulating earnings forecast and report. Capital market prices, $P(\cdot)$, at each point in time equal the conditional expected value of cash flows, $x_1 + x_2$, less a risk-premium proportional to the variance of $x_1 + x_2$. In equilibrium, the forecasting and reporting rules the manager chooses are consistent with the forecasting and reporting rules investors expect the manager to choose. The equilibrium is formally defined as follows.

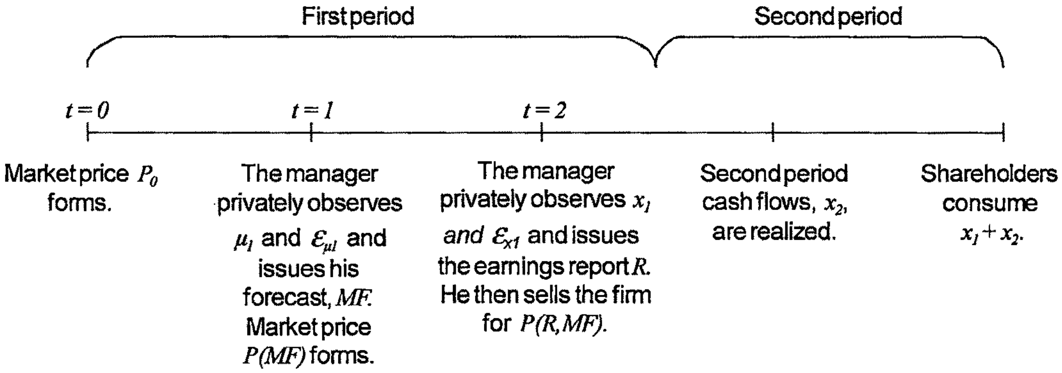
Definition 1: An equilibrium consists of a forecasting rule $MF(\cdot)$, a reporting rule, $R(\cdot)$, and a capital market pricing rule $P(\cdot)$ such that:

(i) Given the pricing function $P(\cdot)$, the manager's private information, $(\mu_1, \varepsilon_{\mu 1}, x_1, \varepsilon_{x1})$, and forecast MF, reported earnings for the first period, $R(\mu_1, \varepsilon_{\mu 1}, x_1, \varepsilon_{x1}, MF)$, maximize:

$$P(R, MF) - \frac{c_1}{2}(MF - \mu_1 - \varepsilon_{\mu 1})^2 - \frac{c_2}{2}(R - x_1 - \varepsilon_{x1})^2;$$

(ii) Given the reporting rule, $R(\cdot)$, and the pricing function, $P(\cdot)$, and the manager's private information, $(\mu_1, \varepsilon_{\mu 1})$, the forecasting rule

FIGURE 1
Sequence of Events


First period
Second period
$t=0$
$t=1$
$t=2$
Market price P_0 forms.
The manager privately observes μ_1 and $\varepsilon_{\mu 1}$ and issues his forecast, MF. Market price $P(MF)$ forms.
The manager privately observes x_1 and ε_{x1} and issues the earnings report R. He then sells the firm for $P(R,MF)$.
Second period cash flows, x_2, are realized.
Shareholders consume x_1+x_2.

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[11] For a formal argument supporting this point, refer to the Appendix. Intuitively, the manager does not care about the actual variance of the firm's cash flow but rather about the variance of the firm's cash flow *as perceived by investors*. For that reason, the manager's incentives do not change if he has private information about the variance of the firm's cash flows.

$MF(\mu_1, \varepsilon_{\mu 1})$ maximizes:

$$E\left[P(R(\tilde{x}_1, \tilde{\varepsilon}_{x1}, MF), MF) - \frac{c_1}{2}(MF - \mu_1 - \varepsilon_{\mu 1})^2 - \frac{c_2}{2}(R(\tilde{x}_1, \tilde{\varepsilon}_{x1}, MF) - \tilde{x}_1 - \tilde{\varepsilon}_{x1})^2 | \mu_1, \varepsilon_{\mu 1}\right];$$

(iii) Given the forecasting rule, $MF(\cdot)$, and the reporting rule, $R(\cdot)$, the capital market prices $P(\Omega)$ satisfy:

$$P(\Omega) = E[\tilde{x}_1 + \tilde{x}_2|\Omega] - \gamma Var[\tilde{x}_1 + \tilde{x}_2|\Omega];$$

where Ω is the publicly available information at the point the capital market price forms, and $\Omega \in \{\{\ \}, \{MF\}, \{MF, R\}\}$.

The definition of equilibrium is straightforward. In part (i), the manager takes the capital market pricing rule as given and decides on the optimal earnings report given the forecast he issued earlier as well as his private information, μ_1, $\varepsilon_{\mu 1}$, x_1, and ε_{x1}. The optimal reporting rule maximizes the firm's market value net of the costs of distorting the earnings report. In part (ii), the manager selects his forecast optimally, anticipating both the pricing rule and his subsequent optimal earnings report. In part (iii), the capital market price of the firm is set consistent with the manager's forecasting and reporting rule. As mentioned above, I assume that the signals released by the manager are the only information available to the capital market in the first period. At the beginning of the first period the investors have not yet received any information by the manager and hence the capital market price is conditioned on their prior beliefs. After the manager makes his forecast, MF, the capital market updates its beliefs about the first and second period cash flows. Similarly, at the end of the first period, the price is a function of both the forecast and the earnings report, taking the manager's optimal forecasting and reporting rules as given. The final price, $P(R, MF)$, is the price that enters the manager's objective function.

III. EQUILIBRIUM

The following proposition characterizes the manager's optimal forecasting and reporting rule and the associated capital market equilibrium prices. In the equilibrium in Proposition 1, the stock price is a quadratic function of both forecast and reported earnings. The quadratic term captures investors updating their beliefs about the variance of the firm's cash flow distribution. While the equilibrium in Proposition 1 is the unique equilibrium in which the price is a quadratic function of both forecast and reported earnings, equilibria of other forms might exist. The straightforward appeal of the equilibrium in Proposition 1 is due to its apparent simplicity while still illustrating the manager's forecasting and reporting incentives when investors are uncertain about both the firm's profitability and riskiness.

Proposition 1: Let $\theta_i = (1 + \rho)^2 \frac{k_i}{1 + k_i} + (1 - \rho^2)$ for $i = 1, 2$. If

$$\gamma \leq \frac{c_2(2\alpha - 1)}{8} \frac{1 + k_2}{\theta_2},$$

there is an equilibrium defined as follows:

(i) The manager's optimal reporting strategy is:

$$R(y_{x1}, MF) = r_0 + r_1 MF + r_2 y_{x1}$$

where $y_{x1} = x_1 + \varepsilon_{x1}$ and the coefficients are:

$$r_2 = \frac{1}{2}\left(1 + \frac{\sqrt{c_2 - \frac{8\gamma}{2\alpha - 1}\frac{\theta_2}{1 + k_2}}}{\sqrt{c_2}}\right)$$

$$r_1 = 1 - r_2$$

$$r_0 = \frac{1 + \rho}{1 + k_2}\frac{1}{r_2}\left(\frac{1}{c_2} + \frac{r_1}{c_1}\right) - \frac{r_1}{c_1}\frac{1 + \rho}{1 + k_1}.$$

(ii) The manager's optimal forecasting rule is:

$$MF(\mu_1) = m_0 + y_{\mu 1}$$

where $y_{\mu 1} = \mu_1 + \varepsilon_{\mu 1}$ and $m_0 = -\frac{1}{c_1}\left(\frac{1 + \rho}{1 + k_1} - \frac{1 + \rho}{1 + k_2}\frac{1}{r_2}\right)$.

(iii) The pricing function $P(R, MF)$ takes the form:

$$P(R, MF) = \pi_0 + \pi_1 MF + \pi_2 R + \pi_3 FE^2$$

where $FE = R - MF$ and the pricing coefficients are:

$$\pi_3 = -\gamma\frac{\theta_2}{1 + k_2}\frac{1}{(2\alpha - 1)r_2^2}$$

$$\pi_2 = \frac{1 + \rho}{1 + k_2}\frac{1}{r_2} - 2\pi_3(r_0 - r_2 m_0)$$

$$\pi_1 = \frac{1 + \rho}{1 + k_1} - \pi_2$$

$$\pi_0 = (1 + \rho)\frac{k_1\bar{\mu}}{1 + k_1} + (1 - \rho)\bar{\mu} - \gamma\left(\theta_1\sigma_\mu^2 + \frac{2\beta\theta_2}{2\alpha - 1}\right) - c_1 m_0^2 - c_2(r_0 + r_1 m_0)^2 + \pi_3(r_0 - r_2 m_0)^2.$$

(iv) The capital market prices at $t = 0$ and $t = 1$ are:

$$P_0 = 2\bar{\mu} - 2\gamma(1 + \rho)\left(\sigma_\mu^2 + \frac{\beta}{\alpha - 1}\right)$$

$$P(MF) = (1 + \rho)\frac{MF - m_0 + k_1\bar{\mu}}{1 + k_1} + (1 - \rho)\bar{\mu} - \gamma\left(2(1 + \rho)\frac{\beta}{\alpha - 1} + \theta_1\sigma_\mu^2\right).$$

A necessary condition for the equilibrium in Proposition 1 to exist is that investors are not too risk-averse, that is, $\gamma \leq \frac{c_2(2\alpha - 1)}{8}\frac{1 + k_2}{\theta_2}$. The intuition for this condition is the following. When the manager chooses the optimal sensitivity of his earnings report to first period cash flows, $\frac{dR}{dx_1} = r_2$, the manager considers both his personal cost from manipulating earnings and investors' risk-aversion as captured in the price coefficient π_3. If investors are highly risk-averse, such that $-\pi_3$ is large relative to c_2, then for any value of $\hat{r}_2$ conjectured by the market, it is optimal for the manager to choose a lower sensitivity of his earnings report to first period cash flows, i.e., $\frac{dR}{dx_1} < \hat{r}_2$. While this is potentially more costly for the manager in terms of manipulating earnings, a lower sensitivity of reported earnings with respect to realized cash flows decreases the riskiness of cash flows as perceived by investors. If investors are highly risk-averse, then the lower risk-premium always exceeds the owner's cost from manipulating earnings and hence no equilibrium of the form in Proposition 1 exists. Instead, there exists an equilibrium in which $\frac{dR}{dx_1} = 0$ and $R(x_1, MF) = MF$ for all realizations of first period cash flows. In such an equilibrium, the capital market price does not depend on reported earnings.[12] To ensure that the equilibrium in Proposition 1 exists, I assume that $\gamma \leq \frac{c_2(2\alpha - 1)}{8}\frac{1 + k_2}{\theta_2}$ for the remainder of the paper.

Since the vector (R, MF) is informationally equivalent to $(y_{x1}, y_{\mu1})$ in equilibrium, the price at the end of the first period equals

$$P(y_{x1}, y_{\mu1}) = E[\tilde{x}_1 + \tilde{x}_2 | y_{x1}, y_{\mu1}] - \gamma Var[\tilde{x}_1 + \tilde{x}_2 | y_{x1}, y_{\mu1}].$$

Using the distributional assumption about the firm's cash flows, $P(y_{x1}, y_{\mu1})$ yields:

$$P(y_{x1}, y_{\mu1}) = (1 + \rho)\left(\frac{k_1\bar{\mu} + y_{\mu1}}{1 + k_1} + \frac{y_{x1} - y_{\mu1}}{1 + k_2}\right) + (1 - \rho)\bar{\mu} - \gamma\left(\theta_1\sigma_\mu^2 + \frac{\theta_2}{1 + k_2}\frac{2\beta(1 + k_2) + (y_{x1} - y_{\mu1})^3}{2\alpha - 1}\right). \quad (1)$$

---

[12] Having reported earnings be independent of realized cash flows is costly for the manager as long as $c_2 > 0$. Hence, for $r_2 = 0$ to be an equilibrium, off-equilibrium beliefs must be in place that impose a penalty for reporting anything other than the deterministic function of MF that is expected in equilibrium. The penalty has to be large enough to cover the cost of the discretionary accruals that the manager is forced to take such that earnings do not depend on the realization of cash flows, x_1. Because of the assumption of normally distributed cash flows, the discretionary accruals are potentially infinite and hence the off-equilibrium penalty has to be infinite, too.

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The above equation highlights how stock prices vary with the information about the firm's first period cash flows that investors infer from management's disclosures. In particular, Equation (1) shows that the noisy signal of first period cash flows, y_{x1}, affects the stock price in two ways. First, the stock price increases in y_{x1} because the sum of expected cash flows, $E[\tilde{x}_1 + \tilde{x}_2|y_{x1}, y_{\mu1}]$, is higher for higher values of y_{x1}. Second, the stock price decreases in the magnitude of the surprise, $|y_{x1} - y_{\mu1}|$, because investors are uncertain about the riskiness of the firm's cash flows and hence use the surprise to update their beliefs about the variance of $\tilde{x}_2$. The latter effect emphasizes the importance of the surprise at the earnings announcement date in the price formation process due to the fact that investors are uncertain about the riskiness of the firm's cash flows. Part (iii) in Proposition 1 shows that the price at the end of the first period can be written as a linear combination of forecast, report, and squared earnings surprise. The coefficient on the squared earnings surprise, π_3, is negative, reflecting a penalty or risk-premium that is proportional to the squared surprise at the earnings announcement date. The economic interpretation of this result is that the risk-averse investors associate a high riskiness of future cash flows with current earnings surprises that are large in magnitude. The functional form of the risk-premium is due to the expected variance term in Equation (1), which is quadratic in the difference between y_{x1} and $y_{\mu1}$.

In this model, investors are fully rational and not deceived by the bias in management's forecast and earnings report. Nevertheless, management continues to distort its private information because it cannot commit to not doing so and investors are unable to observe the extent of forecast and earnings manipulation. Forecast and earnings bias will occur in equilibrium even in the case when investors do not face any information asymmetry with respect to management's incentives and hence are able to perfectly infer management's private information from its earnings forecast and report. As such, the model invokes a signal-jamming framework similar to Narayanan (1985) and Stein (1989). If investors face information asymmetry with respect to management's incentives, then misreporting does not only bias the signals, but also limits the information available to investors. In equilibrium, investors will be able to infer some, but not all, of management's private information. While management's distortion conceals some information from investors, investors are not deceived *on average*. This feature of the equilibrium is similar to other models in which management communicates its private information imperfectly and investors are fully rational (e.g., Fischer and Verrecchia 2000; Fischer and Stocken 2004; Dye and Sridhar 2004; Ewert and Wagenhofer 2005; Guttman et al. 2006).

IV. IMPLICATIONS IF THE MANAGER'S OBJECTIVE FUNCTION DOES NOT CONTAIN NOISE

The equilibrium in Proposition 1 addresses several aspects of the relation among forecasts, earnings reports, earnings persistence, and stock price reactions. Each of the following corollaries discusses a specific property or implication of the equilibrium in Proposition 1 in more detail and provides a link to related empirical findings. Underlying all of the properties discussed below are the manager's incentives to influence not only investors' perception of the firm's expected cash flows, but also investors' perception of the riskiness of the firm's cash flows. In order to provide an explicit intuition for the effect of those two incentives on the manager's forecasting and reporting behavior as well as the associated stock price reaction, I first discuss the case of investors being perfectly informed about the manager's objective function, that is, for $k_1 = k_2 = 0$. In the next section, I then discuss how the noise terms in the manager's objective function affect investors' inferences about firm value and how they affect the manager's forecasting and reporting behavior.

If there is no noise in the manager's objective function, then investors are able to perfectly infer the manager's private information about the firm's first period cash flows, (μ_1, x_1), from the forecast and report the manager issues. Nevertheless, the manager has incentives to manipulate both his forecast and reported earnings because he cannot credibly commit not to manipulate forecast and report and investors rely on the manager's earnings forecast and report when valuing the firm. In particular, investors use the information they receive about the firm's earnings to update their beliefs about both expected cash flows and the variance of cash flows. This provides the manager with incentives to manipulate reported earnings so that investors perceive expected cash flows to be high and the variance of cash flows to be low. The following corollary describes how the manager's reporting function reflects his dual reporting incentives.

Corollary 1: In the equilibrium of Proposition 1 and when $k_1 = k_2 = 0$:

(a) expected first period reported earnings exceed expected first period cash flows, $E[R(\tilde{x}_1, MF(\tilde{\mu}_1))] > E[\tilde{x}_1]$; and
(b) the optimal reporting rule, $R(x_1, MF) = r_0 + r_1 MF + r_2 x_1$, satisfies $r_1, r_2 \in (0, 1)$ and $r_1 + r_2 = 1$.

Investors make inferences about first period cash flows based on reported earnings. Persistence of cash flows leads investors to also update their beliefs about second period expected cash flows when they observe first period reported earnings. Since investors perceive total cash flows to be higher if first period reported earnings are higher, the manager uses his discretion to report first period earnings that, on average, exceed first period cash flows. This reporting behavior is established in part (a) of Corollary 1.

As discussed earlier, the pricing implication of reported earnings is twofold. Based on reported earnings, investors draw inferences not only about the level, but also about the riskiness of future cash flows. Since the capital market attaches a risk-premium to forecast errors (see Proposition 1), the manager has a natural tendency to reduce his forecast error. Part (b) of Corollary 1 states that the manager reduces his forecast error by reporting a weighted average of forecast and cash flows (plus a constant) as first period earnings. Basing reported earnings on a weighted average of forecast and cash flows rather than on cash flows alone essentially "smoothes" the way earnings news is reflected in management forecast and reported earnings.[13] As a result, the variance of reported earnings is smaller than the variance of cash flows.

Rewriting the manager's reporting rule as a function of first period cash flows, x_1, and the difference between his forecast and first period cash flows, $MF - x_1$, further illustrates the manager's tendency to report earnings that are close to his forecast: $R(x_1, MF) = r_0 + x_1 + r_1(MF - x_1)$. If his forecast exceeds first period cash flows, x_1, then the manager reports higher earnings than if his forecast falls short of first period cash flows. In that way, the unknown riskiness of cash flows causes reported earnings to be a function of management's forecast and, equivalently, the discretionary element in reported earnings to depend on the forecast.[14]

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[13] Graham et al. (2005) document that managers smooth earnings because they believe that investors demand a lower risk-premium if the earnings path is smooth.

[14] The relation between voluntary management forecasts and earnings management has also been studied by Dutta and Gigler (2002). In contrast to the model presented here, Dutta and Gigler (2002) study the relation between forecasting and reporting in a moral-hazard setting.

In equilibrium, when the manager reports earnings that are less than his forecast (i.e., when the forecast error measured as the difference between reported earnings, R, and manager's forecast, MF, is negative) the discretionary element in earnings (i.e., the difference between reported earnings, R, and first period cash flows, x_1) is always income-increasing. This follows because the manager's incentives to manipulate the investors' perception of the level and the variability of the firm's cash flows are aligned: manipulating reported earnings upward increases the level of cash flows inferred by investors and also decreases the manager's forecast error. However, this is not the case if first period cash flows exceed the manager's forecast. While manipulating reported earnings upward still increases reported income, it also increases the manager's forecast error. As a consequence, the manager needs to trade off stock price increases due to an increase in the perceived level of cash flows against stock price increases due to a reduction in the perceived riskiness of cash flows. Which effect dominates depends on the magnitude of the difference between cash flows and forecast. If the difference is large, then the variance effect dominates and the manager reports earnings that fall short of first period cash flows to reduce his forecast error. If the difference is small, then a further reduction does not have a significant effect on the perceived variability of cash flows and hence the manager prefers to manipulate reported earnings upward.

The above discussion leads to three additional predictions: (1) the discretionary element in reported earnings and the manager's forecast error are negatively correlated and (2) reported earnings on average exceed cash flows if the manager's forecast error is negative. If the manager's forecast error is positive, then the model does not make any predictions about the sign of the average difference between reported earnings and cash flows. This is, again, a consequence of the manager's contradictory incentives to manipulate earnings when first period cash flows exceed his own forecast. Because of these opposing incentives, the model predicts that (3) the magnitude of the discretionary element in reported earnings is smaller when the forecast error is positive than when the forecast error is negative.[15]

To the extent that discretionary accruals in the empirical literature can proxy for the discretionary element in reported earnings in this model, some of the above predictions have already been tested empirically. Kasznik (1999) provides empirical evidence on the relation between managers' forecast errors and discretionary accruals. He finds that mean and median discretionary accruals are positive if reported annual earnings fall short of the management forecast. If reported earnings exceed the management forecast, then both mean and median discretionary accruals are insignificantly different from zero. While this is largely consistent with the prediction of the relation between earnings management and management forecast described above, it is also consistent with alternative explanations discussed in Kasznik (1999). For instance, reputation concerns or potential legal actions may also cause managers to take discretionary accruals that reduce their own forecast errors. The asymmetry in the findings with respect to the sign of the forecast error may be due to those reputation or legal costs being larger for overestimates than for underestimates.

The degree to which the manager understates the surprise at the earnings announcement date by taking appropriate manipulative action depends on the cost of manipulating earnings and the benefits of making the firm's cash flows appear less risky. The sensitivity of reported earnings to first period cash flows, r_2, reflects this cost-benefit trade-off. Corollary 2 provides related comparative statics.

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[15] The formal proofs of these three predictions are included in the Appendix.

Corollary 2: In the equilibrium of Proposition 1 and when $k_1 = k_2 = 0$, r_2, the sensitivity of reported earnings to first period cash flows:

(a) increases in the cost of manipulating the report, c_2;
(b) decreases in investors' risk-aversion coefficient, γ, and increases in α; and
(c) decreases in the persistence parameter ρ for $\rho < 0$ and increases in ρ for $\rho > 0$.

When choosing reported earnings the manager trades off the pricing implication of reported earnings and his personal cost from manipulating earnings. In equilibrium, the sensitivity of reported earnings to x_1 reflects the trade-off between signaling low riskiness (low sensitivity) and the manager's personal costs from taking manipulative actions. From this it follows that the equilibrium sensitivity is strictly less than 1. This was established in part (a) of Corollary 1. The more expensive it is for the manager to manipulate his report, the closer his report will reflect actual cash flows. It follows that r_2 is increasing in c_2 with $\lim_{c_2 \to \infty} r_2 = 1$. This is established in part (a) of Corollary 2.

As investors become less risk-averse, the manager has fewer incentives to understate the variance of the firm's cash flows and hence the sensitivity of reported earnings to first period cash flows will be greater in equilibrium (part (b) of Corollary 2). To see this, consider the extreme case where investors are risk-neutral and hence do not care about the riskiness of future cash flows ($\gamma = 0$). In this case $P(R, MF) = (1 - \rho)\bar{\mu} - \frac{1}{c_2}(1 + \rho)^2 + (1 + \rho)R$ and $R = \frac{1 + \rho}{c_2} + x_1$ so that the sensitivity of R with respect to x_1 equals 1 while part (a) of Corollary 1 establishes that $r_2 < 1$ in equilibrium. Closely related to this comparative statics result concerning investors' risk-aversion is a comparative statics result concerning investors' *ex ante* beliefs about the firm's variance of cash flows. A higher value of the parameter α corresponds to a lower variance of cash flows as perceived by investors at the beginning of the first period, as well as investors' posterior beliefs being less sensitive to information observed throughout the period. The latter effect diminishes the manager's incentives to manipulate reported earnings, resulting in a higher value of r_2 for higher values of α.

Finally, part (c) of Corollary 2 considers the effect of persistence on the sensitivity of reported earnings to first period cash flows. The persistence and variance of the firm's cash flows are linked in the following way: The better investors are able to predict future cash flows, the lower the remaining uncertainty of cash flows investors face when buying the firm and the lower the manager's incentives to manipulate reported earnings in a way that understates the firm's variance of cash flows. To what extent investors can predict future cash flows depends on the persistence of the firm's cash flows. If $\rho = 1$ or $\rho = -1$, then investors can perfectly predict second period cash flows and the remaining uncertainty is zero. In that case, the firm's end-of-period stock price does not contain any risk premium, and investors' perception of the firm's variance of cash flows is irrelevant. Consequently, the manager does not spend any resources on managing reported earnings in a way that makes cash flows appear less risky. If $\rho = 0$, then first period cash flows do not provide any information about expected second period cash flows. This provides the manager with maximum incentives to manage reported earnings so that investors perceive the firm's cash flows as less risky. Clearly, it is irrelevant whether cash flows are predictable because they are positively or negatively correlated across periods. Hence, we can restate the result in part (c) of Corollary 2 as r_2 being increasing in the magnitude of the persistence parameter, $|\rho|$.

The pricing implication of reported earnings not only affects the manager's reporting strategy but also how equilibrium reporting and forecasting rules compare in terms of expected values.

Corollary 3: In the equilibrium of Proposition 1 and when $k_1 = k_2 = 0$, the expected forecast error, $E[FE] = E[R - MF]$, is:

(a) strictly positive;
(b) increasing in the investors' risk-aversion coefficient γ; and
(c) decreasing in α.

The manager's general tendency to overstate earnings leads to reported earnings that are, on average, larger than the manager's forecast. Hence, the forecast appears to be pessimistic even though it is fully rational relative to the manager's costs and benefits. In Corollary 2, we have seen that reported earnings are less sensitive to cash flows when investors are highly risk-averse or when the prior variance of cash flows is high (low values of α). Conversely, rational investors react strongly to earnings surprises when the sensitivity of reported earnings to cash flows is low because they rationally anticipate that managers have taken manipulative actions to conceal their news. As a consequence, stock prices are very sensitive to earnings surprises, providing managers with large incentives to overstate reported earnings.

The predicted pessimistic bias of the manager's forecast is consistent with management guiding analysts' and stock market expectation downward in order to obtain a positive surprise at the earnings announcement date as suggested by several empirical studies on analysts' forecasts (e.g., Matsumoto 2002; Richardson et al. 2004). Yet, empirical evidence on the bias of management point and range estimates of future earnings is mixed. Choi and Ziebart (2000) analyze the bias in management forecasts as a function of the forecast horizon. The authors find that mean and median forecasts with a forecast horizon of up to three months are pessimistic, while forecasts with a horizon of more than seven months appear optimistic. McNichols (1989) finds no evidence of bias in management forecasts, and other studies, such as Penman (1980) and Rogers and Stocken (2005), document an optimistic bias in management earnings forecasts.

Given any forecast MF, the expected forecast error is $r_0 - r_2 m_0$ and the variance of the forecast error is $\frac{r_2^2\beta}{\alpha - 1}$. The distribution of forecast errors is not normal since the precision is unknown.[16] However, it is still smooth, unimodal, and symmetrically distributed around the mean. A pessimistic bias in the forecast implies that the frequencies of (small) negative forecast errors is smaller than the frequency of (small) positive forecast errors. Higher frequencies of small positive forecast errors over small negative forecast errors have been documented in the empirical literature for a variety of thresholds including analysts' consensus forecasts and past earnings realizations (Hayn 1995; Burgstahler and Dichev

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[16] The distribution of forecast errors is given by:

$$f(FE|MF) = f(FE) = \frac{\Gamma(\alpha + \frac{1}{2})}{\Gamma(\alpha)(2\pi)^{1/2}} * \frac{r_2^{2(\alpha+1/2)}\beta^{\alpha}}{(\frac{1}{2}(FE - r_0 + r_2 m_0)^2 + r_2^2\beta)^{\alpha+1/2}}.$$

1997; Degeorge et al. 1999; Abarbanell and Lehavy 2003). Feng (2004) provides evidence of a similar pattern for earnings surprises relative to point and range management forecasts. However, there is also empirical evidence that the frequency of small positive forecast errors does not just exceed the frequency of small negative forecast errors, but that the distribution of forecast errors is discontinuous around those thresholds. Since the model predicts the distribution of forecast errors to be smooth, an explanation for the empirical finding of a discontinuity around zero is beyond the scope of this model.

The effect of the persistence of cash flows on forecast bias is ambiguous because persistence affects the manager's incentives to manipulate earnings in two ways. On the one hand, higher values of ρ imply that stock prices increase at a faster rate in reported earnings because of the inferences investors draw about second period expected cash flows. As a result, the manager's incentives to overstate earnings are higher if the persistence of cash flows is higher (mean effect). On the other hand, higher magnitudes of ρ reduce the risk-premium, $\gamma Var(\tilde{x}_2|R, MF)$, because investors are better able to predict second period cash flows (see discussion following Corollary 2 part (c)). This causes stock prices to be less sensitive to surprises at the earnings announcement date. As a result, the manager's incentives to increase reported earnings are smaller if the magnitude of the persistence of cash flows is higher (variance effect). For negative values of ρ the direction of the two effects coincide. The more negative the persistence of the firm's cash flows, the lesser are management's incentives to increase reported earnings and hence the smaller the expected equilibrium forecast error. However, for positive values of ρ the two forces are in opposition to each other. Depending on the magnitude of ρ, as well as other parameter values, the expected forecast error can be either increasing or decreasing in ρ for $\rho > 0$. In particular, if investors are sufficiently risk-averse $\left(\gamma \geq \frac{c_2(2\alpha - 1)}{8}\right)$, the variance effect dominates and the manager's forecast bias is decreasing in the persistence of the firm's cash flows. Corollary 4 summarizes these findings.

Corollary 4: In the equilibrium of Proposition 1 and when $k_1 = k_2 = 0$:

(i) if $\rho < 0$, then $\frac{\partial E[FE]}{\partial \rho} > 0$.

(ii) if $\rho \geq 0$ and $\gamma \geq \frac{c_2(2\alpha - 1)}{8}$, then $\frac{\partial E[FE]}{\partial \rho} \leq 0$.

(iii) if $\rho \geq 0$ and $\gamma < \frac{c_2(2\alpha - 1)}{8}$, then:

- $\frac{\partial E[FE]}{\partial \rho} > 0$ if $\rho < \frac{1}{3}$ and $\gamma < \frac{c_2(2\alpha - 1)}{8(1 - \rho^2)} \frac{(1 + \rho)(1 - 3\rho)}{(1 - \rho)^2}$, and
- otherwise $\frac{\partial E[FE]}{\partial \rho} \leq 0$ if $c_1 \leq c_1^*$ and $\frac{\partial E[FE]}{\partial \rho} > 0$ if $c_1 > c_1^*$ where $c_1^* = \left(\frac{r_2(2r_2 - 1)(1 - \rho)}{2r_2 - 1 - \rho} - 1\right) c_2$.

While Corollaries 1 through 4 characterize the equilibrium earnings report and forecast, the following corollary discusses the implications of the manager's optimal forecasting and reporting strategies on the stock market reaction to the news released at the forecast and earnings announcement date.

Corollary 5: In the equilibrium of Proposition 1 and when $k_1 = k_2 = 0$:

(a) the average stock market sensitivity to reported earnings, $E\left[\frac{\partial P(R, MF)}{\partial R}\right]$, is larger than the stock market sensitivity to the management forecast, $\frac{\partial P(MF)}{\partial MF}$;

(b) the difference in stock market sensitivity, $E\left[\frac{\partial P(R, MF)}{\partial R}\right] - \frac{\partial P(MF)}{\partial MF}$, is increasing in the investors' risk-aversion coefficient γ and decreasing in α and the cost of manipulating earnings c_2; and

(c) the difference in stock market sensitivity, $E\left[\frac{\partial P(R, MF)}{\partial R}\right] - \frac{\partial P(MF)}{\partial MF}$, increases in ρ if $\rho < 0$ or $\rho \in \left(0, \frac{1}{3}\right)$ and $\gamma < \frac{(2\alpha - 1)c_2}{8(1 - \rho^2)} \frac{(1 + \rho)(1 - 3\rho)}{(1 - \rho)^2}$ and decreases in ρ if $\rho > \frac{1}{3}$ or $\rho \in \left(0, \frac{1}{3}\right)$ and $\gamma > \frac{(2\alpha - 1)c_2}{8(1 - \rho^2)} \frac{(1 + \rho)(1 - 3\rho)}{(1 - \rho)^2}$.

Consistent with the prediction of Corollary 5, empirical evidence seems to suggest that the market "places more weight" on news at the earnings announcement as measured by the price change relative to the news contained in the earnings forecast. In particular, Pownall et al. (1993) show that the mean and median stock price response coefficients are larger at the earnings announcement date than at the forecast release date. One potential explanation for the difference in stock price response coefficients is systematic differences in the precision of the signal relative to the precision of the investors' beliefs at the forecast release date versus the earnings announcement date.[17]

In the model presented here, the reason for the different stock price response coefficients is not related to the precision of the signals and investor beliefs but rather to the fact that the news at the announcement date is understated in terms of its magnitude because of the manager's incentive to make the firm's cash flows appear less risky. At the time the manager releases his forecast, the stock market learns the mean of the firm's first period cash flows. This merely causes a shift in the expected value of x_1, but has no implication for the perceived riskiness of future cash flows. Hence, the forecasting rule increases in the manager's private signal, μ_1, with a slope of 1. Consequently, the market response coefficient with respect to the forecast at the time the forecast is released is $\frac{\partial P(MF)}{\partial MF} = 1 + \rho$, reflecting the information in the manager's forecast on the sum of expected first and second period cash flows. Since investors rely on reported earnings to update their beliefs about the variance of future cash flows, the sensitivity of reported earnings to the manager's private information is less than 1 ($r_2 < 1$ as established in Corollary 1). To infer the expected total cash flows the market uses $\frac{1 + \rho}{r_2}$ as a multiple on reported earnings. Moreover, in equilibrium, the average stock market reaction to news released at the earnings announcement is also $E\left[\frac{\partial P(R, MF)}{\partial R}\right] = \frac{1 + \rho}{r_2} > 1 + \rho$. Hence, the average stock market reaction to news released at the earnings announcement is larger than the stock market reaction to news contained in the forecast. The more risk-averse investors are, the less sensitive reported earnings are to realized first period cash flows and hence the higher $E\left[\frac{\partial P(R, MF)}{\partial R}\right]$. So, while the price reaction to reported earnings depends on investors' risk-aversion, the price reaction to earnings forecasts does not depend on investors' risk-aversion.

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[17] In contrast, a previous study by Pownall and Waymire (1989) finds that stock prices are more sensitive to management forecasts than to annual earnings announcements.

The next result established in Corollary 5 relates the difference in price response coefficients to the cost of manipulating earnings. As it becomes less costly for the manager to manipulate reported earnings, stock prices react more strongly to surprises at the earnings announcement date. This might seem counter-intuitive. However, recall that the manager uses his manipulative actions to reduce the earnings surprise because of his incentives to manipulate reported earnings so that investors perceive the variance of cash flows to be low. Since investors correctly anticipate the manager's reporting strategy, the stock price reaction to earnings surprises increases as the cost of the manager to manipulate earnings declines.

Part (c) of Corollary 5 describes how the stock price response coefficients at the forecast release date and the earnings announcement date vary with persistence. A change in the persistence of cash flows has two effects on the stock market reaction. First, stock market reactions at the forecast release date and the earnings announcement date become more sensitive to forecasts and reported earnings if the persistence increases because of the inferences investors draw about second period expected cash flows. Second, the stock market reaction at the earnings announcement date becomes less sensitive to reported earnings if the magnitude of the persistence increases because of the manager's incentives to understate the earnings surprise (see Corollary 2 part (c)). Together, the two effects cause the difference between the marginal stock price reactions at the earnings announcement date and at the forecast release date to increase in ρ for $\rho < 0$ and to decrease in ρ for $\rho > \frac{1}{3}$. If $\rho \in (0, \frac{1}{3})$, then other parameter values also affect the sign of the comparative statics.

Building on the results established in the preceding corollaries we can describe the stock market reaction at the earnings announcement date as a function of the magnitude and the sign of the earnings surprise. Letting $\Delta > 0$ denote the magnitude of the earnings surprise, a positive surprise of magnitude Δ implies that $R - MF = \Delta$ and the price following such a surprise is $P(R, MF = R - \Delta)$. If the surprise is negative, then $R - MF = -\Delta$ and $P(R, MF = R + \Delta)$ denote the price following a negative surprise of magnitude Δ.

Proposition 2: In the equilibrium of Proposition 1 and when $k_1 = k_2 = 0$:

(a) the stock market price at the end of the first period is on average decreasing in the forecast, *MF*, holding reported earnings constant;
(b) holding the level of reported earnings and the magnitude of the earnings surprise constant, the stock market price at the end of

the first period is higher following a positive surprise than following a negative surprise; that is, $P(R, R - \Delta) - P(R, R + \Delta) > 0$; and

(c) holding the level of reported earnings and the magnitude of the earnings surprise constant, the stock price premium associated with a positive surprise compared to a negative surprise, $P(R, R - \Delta) - P(R, R + \Delta)$, increases in the magnitude of the earnings surprise, Δ.

Since investors are risk-averse, the manager has incentives to manipulate the earnings report in a way that cash flows appear less risky. This causes reported earnings to be a weighted average of the forecast and first period cash flows where both weights, r_1 and r_2, are positive. From this it follows that holding reported earnings constant investors will infer higher first period cash flows from a lower forecast. As a result, the firm's market price at the end of the first period is on average decreasing in the manager's forecast. In the present model, total excess returns, $\frac{P(R, MF) - P_0}{P_0}$, behave the same as stock prices at the end of the period, $P(R, MF)$, and hence the findings in Proposition 2 can be restated in terms of returns. Part (a) of Proposition 2 predicts that returns measured over a period that includes both forecast release and earnings announcement decrease in the manager's forecast. Similarly, part (b) states that a firm earns excess returns if its earnings surprise is positive compared to if its earnings surprise is negative, holding reported earnings and the magnitude of the surprise constant. Finally, part (c) predicts the excess return to be increasing in the magnitude of the surprise.

While it is not true in general that the stock price at the end of the first period is decreasing in the forecast for any forecast error, Proposition 2 shows that controlling for the magnitude of the surprise (i.e., magnitude of forecast error) and reported earnings, the price following a positive surprise, $P(R, R - \Delta)$, is always higher than the price following a negative surprise, $P(R, R - \Delta)$, where Δ denotes the magnitude of the earnings surprise, $|R - MF|$. The intuition for this kind of path dependence is the following. With respect to the price component that reflects the firm's expected cash flows, a lower forecast is uniformly desirable, that is, $E[\tilde{x}_1 + \tilde{x}_2|MF, R]$ declines in MF. But, this is not true for the risk component of market price, $-\gamma Var[\tilde{x}_1 + \tilde{x}_2|R, MF]$, since MF affects this risk component of prices non-monotonically. However, the pessimistic forecast bias causes the market to infer a higher variance of underlying cash flows if the forecast exceeds reported earnings by an amount Δ (negative earnings surprise) than if the forecast falls short of reported earnings by the same amount (positive earnings surprise). Hence, holding the magnitude of the surprise constant, a positive surprise is always preferred.

The relation between returns, forecasts or earnings preannouncements, and reported earnings has been studied empirically. Soffer et al. (2000) provide evidence that controlling for the magnitude of the total news released (measured as the difference between reported earnings and analysts' consensus forecast prior to the release of the management earnings preannouncement) the total excess return over the time period that contains both earnings preannouncement and earnings announcement is lower for firms that have negative surprises at the earnings announcement. That is, firms with negative total news have lower excess returns if they announced only a fraction of their total news at the earnings preannouncement and have another negative surprise at the earnings announcement date relative to firms that have the same amount of total news but exaggerated their negative news at the earnings preannouncement and hence have a positive surprise at the earnings announcement. Moreover, Soffer et al. (2000) find that the opposite holds for firms with positive total news. In that case, the excess return is higher if firms understate their positive news at the earnings preannouncement and, again, have a positive surprise relative to firms that announce all of their positive news at the earnings preannouncement. Hence, in both cases, for positive as well as negative total news, the excess return is higher if the forecast is lower and the surprise at the announcement is positive. This seems broadly consistent with the prediction in part (a) of Proposition 2.[18]

The paper studies management's forecasting and reporting behavior and stock market reactions to management's earnings forecast and reports. The model's major innovation is to consider the effect of investors using information to update their beliefs about two aspects: a firm's expected cash flows as well as the riskiness of these cash flows. For that reason, it is valuable to highlight once more how investors' uncertainty about the variance of the firm's cash flows affects the model's equilibrium. This is best achieved by contrasting the current model's predictions with the predictions that would have been generated under the assumption that investors know the variance of the firm's cash flows.

If investors know the variance of cash flows, the firm's stock price would be independent of both the manager's forecast and the error in that forecast; only the manager's earnings report would influence the firm's stock price. As a result, the model would predict that the manager over-reports his private signal by a constant when he reports earnings (a standard result in the costly state falsification literature). Moreover, the variance of the firm's earnings would equal the variance of its cash flows rather than being lower than the variance of its cash flows. The model's predictions discussed in this section would change as follows: (1) the manager would *not* manipulate earnings to reduce his forecast error at the earnings announcement date, (2) the stock price sensitivity to the firm's actual earnings announcement is the *same as* the sensitivity to the release of the manager's forecast, and (3) controlling for the level of reported earnings and the magnitude of the earnings surprise, the firm's price would *not* be higher when it has a positive surprise at the earnings announcement date than when it has a negative surprise. The changes in the model's predictions highlight the importance of taking into account that the variance of cash flows is unknown to investors when studying managements' reporting behavior and stock market reactions to corporate disclosures.[19]

V. IMPLICATIONS IF THE MANAGER'S OBJECTIVE FUNCTION CONTAINS NOISE

In the previous section, investors were able to perfectly infer the manager's private information about the first period cash flows from his forecast and earnings report. In practice, investors may not have the ability to make such inferences. To capture investors' inability to make perfect inferences, the model setup introduced noise terms in the manager's objective function that are unknown to investors. These noise terms affect the cost of manipulating the earnings forecast and reported earnings and reflect idiosyncratic circumstances that cannot be observed by investors. In equilibrium, the noise terms prevent investors from perfectly inferring the firm's first period cash flows by observing the manager's forecast and earnings report. Instead, investors can only infer the noisy signals ($y_{\mu 1}$, y_{x1}) of the manager's private information about first period cash flows, (μ_1, x_1).

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[18] However, the model does not reflect some key elements of the setting in Soffer et al. (2000) since the authors select their sample in a way to reduce the likelihood that managers received significant additional information after the earnings preannouncement by requiring that the earnings preannouncement be made no more than two weeks before the end of the quarter.

[19] The effect of known precision can be seen by taking the limit for $\alpha \rightarrow \infty$ and setting $\beta = \frac{\alpha}{E[\tilde{\tau}]}$, such that the expected precision of the firm's cash flows remains unchanged. Then, $\lim_{\alpha \rightarrow \infty} \pi_1 = \lim_{\alpha \rightarrow \infty} \pi_3 = 0$, $MF = \mu_1$ and $R = \frac{1 + \rho}{c_2} + x_1$ in the equilibrium of Proposition 1. In a repeated game, firm value might still depend on management forecasts (e.g., Stocken 2000).

In the case when there is no noise in the manager's objective function (hereafter, no-noise case), investors are able to infer first period cash flows in equilibrium based on earnings forecast and report: $x_1 = \frac{R - r_0 - r_1 - MF}{r_2}$. This provides managers with incentives to manipulate reported earnings upward and the forecast downward. In contrast, if investors are not able to perfectly infer first period cash flows in equilibrium, then the manager faces different incentives to manipulate his forecast and earnings report. Investors' expectations about first period cash flows are $\bar{\mu} + \frac{y_{\mu 1} - \bar{\mu}}{1 + k_1} + \frac{y_{x1} - y_{\mu 1}}{1 + k_2}$. As in the no-noise case, investors infer y_{x1} from earnings report and forecast as $\frac{R - r_0 - r_1 - MF}{r_2}$ and the manager can increase investors' beliefs about y_{x1} by either issuing a higher earnings report or a lower forecast. However, the forecast affects investors' expectations about the firm's cash flows not only through their inference of $y_{x1} = \frac{R - r_0 - r_1 - MF}{r_2}$, but also through their inference of $y_{\mu 1} = MF - m_0$. The manager can increase investors' perception of $y_{\mu 1}$ by issuing a higher forecast. As a result, while a lower forecast increases investors' perception of y_{x1}, it simultaneously decreases their perception of $y_{\mu 1}$. Whether the manager prefers to bias his forecast upward or downward depends on how much investors learn about the firm's cash flow at the forecast release and the earnings reporting date, respectively, that is, on how k_1 and k_2 compare. If $k_1 \geq k_2$ then the information at the earnings announcement date is garbled to a lesser extent than at the forecast release date and $E[\tilde{x}_1 | y_{\mu 1}, y_{x1}]$ decreases in $y_{\mu 1}$ and $E[\tilde{x}_1 | MF, R]$ decreases in MF. This provides the manager with incentives to manipulate the forecast downward as in the no-noise case. If, in contrast, $k_1 < k_2$, then the information at the earnings announcement date is garbled to a greater extent than at the forecast release date and $E[\tilde{x}_1 | y_{\mu 1}, y_{x1}]$ decreases in $y_{\mu 1}$. Whether $E[\tilde{x}_1 | MF, R]$ decreases or increases in MF then depends on several factors, including how k_1 and k_2 compare in terms of magnitude and to what extent the manager's earnings report relies on his forecast.

Since for $k_1 \geq k_2$ the manager's incentives to manipulate forecast and reported earnings do not qualitatively differ from the no-noise case, $k_1 \geq k_2$ is a sufficient condition for the predictions of the previous section to continue to hold.[20] The condition $k_1 \geq k_2$ captures that information revealed at the earnings announcement date is less garbled than at the forecast release date. This could, for example, be due to the auditing process that provides reassurance about the information disclosed at the earnings announcement date. Even though the predictions of the previous section do not change qualitatively if $k_1 \geq k_2$, the magnitude of the coefficients does depend on the amount of noise in the manager's objective function. The noise in the manager's objective function affects the coefficients due to two related effects. First, the noise determines how investors update their beliefs about both the expected value and the riskiness of the firm's cash flows. Second, investors' belief formation process affects management incentives to manipulate forecast and report. Even though these considerations are reflected in the magnitude of the various coefficients characterizing the equilibrium, they do not qualitatively affect the predictions discussed in the previous section.

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[20] The only exceptions are the comparative statics of the expected forecast error and difference in stock market reaction with respect to the persistence of cash flows, ρ. The threshold for which the expected forecast error and difference in stock market reaction are decreasing or increasing in ρ depends also on the variance of the noise terms, that is, k_1 and k_2.

This is not the case, however, if $k_1 < k_2$. If $k_1 < k_2$, the information contained in reported earnings is more garbled than the information contained in the manager's forecast. Depending on various factors, including by how much k_2 exceeds k_1, the manager faces qualitatively different incentives than in the case when there is no noise or $k_1 \geq k_2$. For instance, as discussed above, the manager might overstate his private information at the forecast release date rather than understate it and the stock market might more strongly react to the release of the forecast than to the release of earnings. How the predictions play out depends on various parameters of the model. Details are provided in the Appendix.

As in the no-noise case, the model's predictions originate in investors' uncertainty about the variance of the firm's cash flows. If one were to assume that investors knew the variance of cash flows, then the firm's stock price would equal $P(R, MF) \propto \left(\frac{1+\rho}{1+k_1} - \frac{1+\rho}{1+k_2}\right) MF + \frac{1+\rho}{1+k_2} R$ where reported earnings are $R = \frac{1+\rho}{(1+k_2)c_2} + y_{x1}$. That is, the firm's stock price would be independent of the manager's squared forecast error. Moreover, the model would predict that the manager over-reports his private signal by a constant (a standard result in the costly state falsification literature) when he reports earnings and that his optimal earnings report would not depend on his forecast. As a result, the manager would *not* manipulate earnings to reduce his forecast error at the earnings announcement date. Comparing the above pricing equation and reporting strategy to the equilibrium in Proposition 1 highlights the importance of accounting for the fact that investors are uncertain about a firm's cash flow risk when deriving empirical predictions.

VI. CONCLUSION

This paper develops an analytical model of an owner-manager who discloses a forecast of his firm's earnings during the period and who releases a possibly manipulated value of the firm's earnings at the end of the period. The paper derives predictions about the manager's incentives to bias his forecast and to manage the firm's earnings as well as the capital market's equilibrium reaction to the manager's disclosures. In this model, disclosures provide information about firm value to future investors. A key feature of the model is that the variance of the firm's cash flows is unknown to the capital markets, and constant over time. Investors can therefore learn about both the mean and variance of future cash flows from the earnings forecast the manager releases and the reported value of the firm's earnings. Since the manager attempts to maximize the firm's capital market value net of his personal costs of forecast management and earnings manipulation, his optimal forecasting and reporting strategies are affected by, and affect, the inferences investors make about both the expected value and variance of the firm's cash flows.

I have contrasted the predictions of the model with existing empirical results regarding discretionary accruals and management forecasts. Several of the predictions of the model are consistent with established empirical results. However, the model does not address aspects of timing, frequency, and precision of management earnings forecasts as well as richer disclosure sets such as long- and short-term forecasts. Some of these aspects have received attention in the empirical literature lately. For example, Ruland et al. (1990) study factors that influence managements' decision whether to release earnings forecasts. Given that management issued an earnings forecast, Bamber and Cheon (1998) and Baginski and Hassell (1997) examine managers' choice of the precision of the forecast and Rogers and Van Buskirk (2006) and Beniluz (2007) study the characteristics of earnings forecasts concurrently released with reported earnings. Incorporating some of these aspects into the model would constitute interesting extensions.

APPENDIX

Specification of Distributional Assumptions for the Equilibrium in Proposition 1

Cash flows in period $n = 1, 2$ are given by $\tilde{x}_n = \tilde{\mu}_n + \tilde{v}_n$. Given τ, the vector $(\tilde{\mu}_1, \tilde{\mu}_2, \tilde{v}_1, \tilde{v}_2)$ is distributed multivariate normal with mean $(\bar{\mu}, \bar{\mu}, 0, 0)$ and variance-covariance matrix:

$$\begin{bmatrix} \sigma_\mu^2 & & & \\ \rho\sigma_\mu^2 & \sigma_\mu^2 & & \\ 0 & 0 & \frac{1}{\tau} & \\ 0 & 0 & \rho\frac{1}{\tau} & \frac{1}{\tau} \end{bmatrix}.$$

Proof of Proposition 1

Conjectured Equilibrium

$$P(R, MF) = p_0 + p_2MF + p_2R + p_3\left(\frac{R - (r_0 + r_1MF)}{r_2} - MF + m_0\right)^2 \tag{2}$$

$$R(y_{x1}, MF) = r_0 + r_1MF + r_2y_{x1} \tag{3}$$

$$MF(y_{\mu1}) = m_0 + y_{\mu1}. \tag{4}$$

At the end of the first period ($t = 2$) the manager chooses R such as to maximize $P(R, MF) - \frac{c_1}{2}(MF - y_{\mu1})^2 - \frac{c_2}{2}(R - y_{x1})^2$ where $P(R, MF) = p_0 + p_1MF + p_2R + p_3 * \left(\frac{R - (\hat{r}_0 - \hat{r}_1MF)}{\hat{r}_2} - MF + \hat{m}_0\right)^2$. The hats above the coefficients indicate that these are the conjectured coefficients the capital market uses when valuing the company at the end of the first period. Solving for R yields the following first-order condition:

$$0 = p_2 + \frac{2p_3}{\hat{r}_2}\left(\frac{R - (\hat{r}_0 + \hat{r}_1 MF)}{\hat{r}_2} - MF + \hat{m}_0\right) - c_2(R - y_{x1})$$

$$R = \frac{p_2\hat{r}_2^2 + 2p_3(-(\hat{r}_0 + \hat{r}_1 MF) - \hat{r}_2 MF + \hat{r}_2\hat{m}_0) + c_2\hat{r}_2^2 y_{x1}}{c_2\hat{r}_2^2 - 2p_3}. \tag{5}$$

The second-order condition to the manager's optimization problem at $t = 2$ yields $\frac{2p_3}{\hat{r}_2^2} - c_2 < 0$ which is always satisfied if $p_3 < 0$ as will be the case in equilibrium. Equation (5) shows that the manager's optimal reporting strategy is linear in y_{x1} and MF as conjectured in Equation (3). In equilibrium, the optimal report in Equation (5) has to equal the $R(y_{x1}, MF)$ as in Equation (3) for all possible values of (y_{x1}, MF). Equating coefficients yields $r_0 = \frac{p_2\hat{r}_2^2 + 2p_3(-\hat{r}_0 + \hat{r}_2\hat{m}_0)}{c_2\hat{r}_2^2 - 2p_3}$, $r_1 = -\frac{2p_3(\hat{r}_1 + \hat{r}_2)}{c_2\hat{r}_2^2 - 2p_3}$ and $r_2 = \frac{c_2\hat{r}_2^2}{c_2\hat{r}_2^2 - 2p_3}$. In equilibrium, the conjectured coefficients has to equal the true coefficients, i.e., $r_0 = \hat{r}_0$, $r_1 = \hat{r}_1$, and $r_2 = \hat{r}_2$, and hence:

$$r_0 = \frac{2p_2 + m_0\sqrt{c_2^2 + 8p_3c_2} - c_2m_0}{2c_2} \tag{6}$$

$$r_1 = \frac{1}{2}\left(1 - \frac{\sqrt{c_2 + 8p_3}}{\sqrt{c_2}}\right) \tag{7}$$

$$r_2 = \frac{1}{2}\left(1 + \frac{\sqrt{c_2 + 8p_3}}{\sqrt{c_2}}\right). \tag{8}$$

Next, we solve the manager's forecasting problem at $t = 1$.

$$\max_{MF} E\left[P(R(\tilde{y}_{x1}, MF), MF) - \frac{c_1}{2}(MF - y_{\mu1})^2 - \frac{c_2}{2}(R(\tilde{y}_{x1}, MF) - \tilde{y}_{x1})^2 | y_{\mu1}\right];$$

where the manager anticipates his optimal reporting strategy $R(MF, y_{x1}) = r_0 + r_1 MF + r_2 y_{x1}$ at $t = 2$ with the coefficients r_0, r_1, and r_2 given by (6)–(8). The first-order condition for MF yields:

$$\begin{aligned} &p_1 + p_2r_1 - 2p_3(E[\tilde{y}_{x1}|y_{\mu1}] - MF + \hat{m}_0) - c_1(MF - y_{\mu1}) \\ &\quad - c_2r_1E[r_0 + r_1MF + (r_2 - 1)\tilde{y}_{x1}|y_{\mu1}] = 0 \end{aligned}$$

$$\begin{aligned} &p_1 + p_2r_1 - 2p_3(y_{\mu1} - MF + \hat{m}_0) - c_1(MF - y_{\mu1}) \\ &\quad - c_2r_1(r_0 + r_1MF + (r_2 - 1)y_{\mu1}) = 0. \end{aligned}$$

The second-order condition is $2p_3 - c_1 - c_2r_1^2 < 0$, which is always satisfied if $p_3 < 0$ (as will be the case in equilibrium). From Equations (7)–(8) we know that $r_1 + r_2 = 1$. Solving the first-order condition yields $MF = y_{\mu1} + \frac{p_1 + p_2r_1 - 2p_3\hat{m}_0 - c_2r_1r_0}{-2p_3 + c_1 + c_2r_1^2}$. As conjectured the optimal forecast is linear in $y_{\mu1}$ with a slope coefficient of 1. In equilibrium, the optimal forecast above has to equal the forecasting strategy conjectured by the capital market for all possible values of $y_{\mu 1}$. Equating intercept coefficient yields $m_0 = \frac{p_1 + p_2 r_1 - 2p_3 \hat{m}_0 - c_2 r_1 r_0}{-2p_3 + c_1 + c_2 r_1^2}$. In equilibrium, it also has to be the case that $m_0 = \hat{m}_0$ and hence we can solve for m_0. Some algebraic simplification yields $m_0 = \frac{p_1}{c_1}$ and hence $MF(y_{\mu 1}) = y_{\mu 1} + \frac{p_1}{c_1}$. We can use this result to compute the intercept of the manager's reporting strategy in Equation (6). Finally, we can use the optimal forecasting and reporting rules to derive consistent pricing coefficients. In equilibrium:

$$P(R, MF) = E[\tilde{x}_1 + \tilde{x}_2|R, MF] - \gamma Var[\tilde{x}_1 + \tilde{x}_2|R, MF] \tag{9}$$

where:

$$\begin{aligned} P(R, MF) &= p_0 + p_1 MF + p_2 R + p_3 \left(\frac{R - (r_0 + r_1 MF)}{r_2} - MF + m_0\right)^2 \\ &= p_0 + p_1 \left(y_{\mu 1} + \frac{p_1}{c_1}\right) + p_2 \left(\frac{p_2}{c_2} + y_{\mu 1} + r_2(y_{x1} - y_{\mu 1})\right) \\ &\quad + p_3(y_{x1} - y_{\mu 1})^2. \end{aligned} \tag{10}$$

To compute the RHS of Equation (9) we need expressions for the conditional expected value and variance of the liquidating dividend, $\tilde{x}_1 + \tilde{x}_2$. From the manager's forecasting and reporting strategy it follows that the vector (MF, R) is informationally equivalent to $(y_{\mu 1}, y_{x1})$. Hence, $E[\tilde{x}_1 + \tilde{x}_2|R, MF] = E[\tilde{x}_1 + \tilde{x}_2|y_{\mu 1}, y_{x1}] = (1 + \rho)\left(\frac{k_1 \bar{\mu} + y_{\mu 1}}{1 + k_1} + \frac{y_{x1} - y_{\mu 1}}{1 + k_2}\right) + (1 - \rho)\bar{\mu}$ and $Var[\tilde{x}_1 + \tilde{x}_2|R, MF] = Var[\tilde{x}_2 \cdot y_{\mu 1}, y_{x1}]$ where:

$$\begin{aligned} &Var[\tilde{x}_1 + \tilde{x}_2 \cdot y_{\mu 1}, y_{x1}, \tau] \\ &\quad = (1 + \rho)^2 Var[\tilde{\mu}_1 + (\tilde{x}_1 - \tilde{\mu}_1)|y_{\mu 1}, y_{x1}, \tau] + (1 - \rho^2)\left(\sigma_\mu^2 + \frac{1}{\tau}\right) \\ &\quad = (1 + \rho)^2 \left(\sigma_\mu^2 - \frac{1}{1 + k_1}\sigma_\mu^2 + \frac{1}{\tau} - \frac{1}{1 + k_2}\frac{1}{\tau}\right) + (1 - \rho^2)\left(\sigma_\mu^2 + \frac{1}{\tau}\right) \\ &\quad = \theta_1 \sigma_\mu^2 + \theta_2 \frac{1}{\tau}. \end{aligned}$$

To compute the second summand first note that if $\tilde{\tau}$ is distributed gamma with shape-parameter $\hat{\alpha}$ and scale-parameter $\hat{\beta}$, then $E\left[\frac{1}{\tilde{\tau}}\right] = \frac{\hat{\beta}}{\hat{\alpha} - 1}$. Since $\frac{y_{x1} - y_{\mu 1}}{\sqrt{1 + k_2}} = \frac{\tilde{v}_1 + \tilde{\varepsilon}_{v1}}{\sqrt{1 + k_2}} \sim N(0, \tau)$ and $g(\tau|y_{x1}, y_{\mu 1})$ is distributed gamma with $\hat{\alpha} = \alpha + \frac{1}{2}$ and $\hat{\beta} = \beta + \frac{1}{2(1 + k_2)}(y_{x1} - y_{\mu 1})^2$ it follows that:

$$E\left[\frac{1}{\tilde{\tau}} \,\middle|\, y_{x1}, y_{\mu 1}\right] = \frac{\hat{\beta}}{\hat{\alpha}-1} = \frac{\beta + \frac{1}{2(1+k_2)}(y_{x1}-y_{\mu 1})^2}{\alpha - \frac{1}{2}}$$

$$= \frac{1}{1+k_2}\,\frac{2\beta(1+k_2)+(y_{x1}-y_{\mu 1})^2}{2\alpha - 1}.$$

and the RHS of (9) yields:

$$\begin{aligned} &E[\tilde{x}_1 + \tilde{x}_2|R, MF] - \gamma Var[\tilde{x}_1 + \tilde{x}_2|R, MF] \\ &= (1+\rho)\left(\frac{k_1\bar{\mu} + y_{\mu 1}}{1+k_1} + \frac{y_{x1}-y_{\mu 1}}{1+k_2}\right) + (1-\rho)\bar{\mu} \\ &\quad - \gamma\left(\theta_1\sigma_\mu^2 + \frac{\theta_2}{1+k_2}\,\frac{2\beta(1+k_2)+(y_{x1}-y_{\mu 1})^2}{2\alpha-1}\right). \end{aligned} \tag{11}$$

Equating the intercept and the coefficients for y_{x1}, $y_{\mu 1}$, and $(y_{x1} - y_{\mu 1})^2$ respectively for Equations (10) and (11) and solving for the pricing coefficients, p_0, p_1, p_2, and p_3, yields:

$$p_2 = \frac{1+\rho}{1+k_2}\,\frac{1}{r_2}$$

$$p_1 = \frac{1+\rho}{1+k_1} - \frac{1+\rho}{1+k_2} - p_2(1-r_2) = \frac{1+\rho}{1+k_1} - \frac{1+\rho}{1+k_2}\,\frac{1}{r_2}$$

$$p_3 = -\gamma\,\frac{\theta_2}{1+k_2}\,\frac{1}{2\alpha-1}$$

$$p_0 = (1+\rho)\frac{k_1\bar{\mu}}{1+k_1} + (1-\rho)\bar{\mu} - \gamma\left(\theta_1\sigma_\mu^2 + \frac{2\beta\theta_2}{2\alpha-1}\right) - \frac{p_1^2}{c_1} - \frac{p_2^2}{c_2}.$$

Letting $FE = R - MF$ and using the fact that in equilibrium $r_1 + r_2 = 1$, we can rewrite the pricing equation:

$$P(R, MF) = p_0 + p_1 MF + p_2 R + \frac{p_3}{r_2^2}(FE^2 - 2(r_0 - r_2 m_0)FE + (r_0 - r_2 m_0)^2)$$

and hence $P(R, MF) = \pi_0 + \pi_1 MF + \pi_2 R + \pi_3 FE^2$ where the coefficients are given by $\pi_0 = p_0 + \frac{p_3}{r_2^2}(r_0 - r_2 m_0)^2$, $\pi_1 = p_1 + \frac{2p_3}{r_2^2}(r_0 - r_2 m_0)$, $\pi_2 = p_2 - \frac{2p_3}{r_2^2}(r_0 - r_2 m_0)$, and $\pi_3 = \frac{p_3}{r_2^2}$. ■

Effect of Additional Private Information about τ

Suppose the manager privately observed the realization of τ before issuing the forecast (or after issuing the forecast but before issuing the report). It turns out that the same equilibrium as in Proposition 1 would exist. That is, there exists an equilibrium in which the manager's disclosure strategy does not depend on his private information about the riskiness of the firm. However, other equilibria may exist. To see that the equilibrium in Proposition 1 is robust to the manager having private information about the variance of the firm's cash flows, first consider the manager's reporting strategy. As there is no uncertainty from the manager's perspective, his optimization problem at the earnings announcement date remains unchanged. Next, consider the manager's optimization problem at the time when he issues the forecast. If the manager privately observed τ, he maximizes:

$$\max_{MF} E\left[P(R(\tilde{y}_{x1}, MF), MF) - \frac{c_1}{2}(MF - y_{\mu 1})^2 - \frac{c_2}{2}(R(\tilde{y}_{x1}, MF) - \tilde{y}_{x1})^2 | y_{\mu 1}, \tau\right];$$

where the manager anticipates his optimal reporting strategy $R(MF, y_{x1}) = r_0 + r_1 MF + r_2 y_{x1}$ at $t = 2$. The pricing function the manager takes as given is the same as at $t = 2$.

$$\begin{aligned} &E[p_0 + p_1 MF + p_2(r_0 + r_1 MF + r_2 \tilde{y}_{x1}) + p_3(y_{x1} - MF + \hat{m}_0)^2 | y_{\mu 1}, \tau] \\ &\quad - \frac{c_1}{2}(MF - y_{\mu 1})^2 - \frac{c_2}{2} E[(r_0 + r_1 MF + r_2 \tilde{y}_{x1} - \tilde{y}_{x1})^2 | y_{\mu 1}, \tau] \\ &= p_0 + p_1 MF + p_2(r_0 + r_1 MF + r_2 y_{\mu 1}) + p_3\left[\frac{1}{\tau} + y_{\mu 1}^2 - 2y_{\mu 1}(MF - \hat{m}_0)\right. \\ &\quad \left. + (MF - \hat{m}_0)^2\right] - \frac{c_1}{2}(MF - y_{\mu 1})^2 - \frac{c_2}{2}\left[(r_0 + r_1 MF)^2\right. \\ &\quad \left. - 2(r_0 + r_1 MF) r_1 y_{\mu 1} + r_1^2\left(\frac{1}{\tau} + y_{\mu 1}^2\right)\right]. \end{aligned}$$

The first-order condition for MF yields:

$$\begin{aligned} &p_1 + p_2 r_1 + p_3(-2y_{\mu 1} + 2(MF + \hat{m}_0)) \\ &\quad - c_1(MF - y_{\mu 1}) - \frac{c_2}{2}(2r_1(r_0 + r_1 MF) - 2r_1^2 y_{\mu 1}) = 0 \end{aligned}$$

which is the same condition as in the case when the manager does not know τ. Hence, the forecasting and reporting strategies remain optimal even if the manager privately observes τ. ■

Proof of Corollary 1

Part (a). Using $r_1 + r_2 = 1$ (see Proposition 1).

$$\begin{aligned} E[R(\tilde{x}_1, MF(\tilde{\mu}_1))] - E[\tilde{x}_1] &= r_0 + r_1(m_0 + \bar{\mu}) + r_2\bar{\mu} - \bar{\mu} \\ &= \frac{p_2}{c_2} - r_1\frac{p_1}{c_1} + r_1\frac{p_1}{c_1} = \frac{p_2}{c_2} > 0. \end{aligned}$$

Part (b). I show that $r_2 \in (\frac{1}{2}, 1)$ for all parameter values.

$$r_2 = \frac{1}{2}\left(1 + \frac{\sqrt{c_2 + 8p_3}}{\sqrt{c_2}}\right) > \frac{1}{2} \Leftrightarrow \frac{\sqrt{c_2 + 8p_3}}{\sqrt{c_2}} > 0$$

$$r_2 = \frac{1}{2}\left(1 + \frac{\sqrt{c_2 + 8p_3}}{\sqrt{c_2}}\right) < 1 \Leftrightarrow \sqrt{c_2} > \sqrt{c_2 + 8p_3} \qquad (12)$$

where Equation (12) follows from $p_3 < 0$. $r_1 + r_2 = 1$ follows immediately from the proof of Proposition 1. ■

Proof of Additional Predictions on Discretionary Accruals

Part (i): Discretionary accruals and forecast error are negatively correlated.

$$\widetilde{DA} = R(MF(\tilde{\mu}_1), \tilde{x}_1) - \tilde{x}_1 = r_0 + r_1 m_0 + r_1(\tilde{\mu}_1 - \tilde{x}_1) = \frac{p_2}{c_2} - r_1\tilde{v}_1$$

$$\widetilde{FE} = R(MF(\tilde{\mu}_1), \tilde{x}_1) - MF(\tilde{\mu}_1) = \frac{p_2}{c_2} - \frac{p_1}{c_1} + r_2(\tilde{x}_1 - \tilde{\mu}_1) = \frac{p_2}{c_2} - \frac{p_1}{c_1} + r_2\tilde{v}_1$$

$$Cov(\widetilde{DA}, \widetilde{FE}) = -r_1 r_2 Var(\tilde{v}_1) < 0.$$

Part (ii): Expected discretionary accruals are positive if the forecast error is negative. Using the fact that $r_1 > 0$ we have:

$$E[\widetilde{DA}|\widetilde{FE} < 0, \tau] = \frac{p_2}{c_2} - r_1 E\left[\tilde{v}_1 | \tilde{v}_1 < -\frac{1}{r_2}\left(\frac{p_2}{c_2} - \frac{p_1}{c_1}\right), \tau\right]$$
$$= \frac{p_2}{c_2} + \frac{r_1}{\tau}\frac{\phi\left(-\frac{\sqrt{\tau}}{r_2}\left(\frac{p_2}{c_2} - \frac{p_1}{c_1}\right)\right)}{\Phi\left(-\frac{\sqrt{\tau}}{r_2}\left(\frac{p_2}{c_2} - \frac{p_1}{c_1}\right)\right)} > 0$$

$$E[\widetilde{DA}|\widetilde{FE} > 0, \tau] = \frac{p_2}{c_2} - r_1 E\left[\tilde{v}_1 | \tilde{v}_1 > -\frac{1}{r_2}\left(\frac{p_2}{c_2} - \frac{p_1}{c_1}\right), \tau\right]$$
$$= \frac{p_2}{c_2} - \frac{r_1}{\tau}\frac{\phi\left(-\frac{\sqrt{\tau}}{r_2}\left(\frac{p_2}{c_2} - \frac{p_1}{c_1}\right)\right)}{1 - \Phi\left(-\frac{\sqrt{\tau}}{r_2}\left(\frac{p_2}{c_2} - \frac{p_1}{c_1}\right)\right)}$$

where $\phi(\cdot)$ and $\Phi(\cdot)$ denote the probability density function and the cumulative density function for the standard normal distribution respectively. (To see that $E[\widetilde{DA}|\widetilde{FE} > 0, \tau]$ can be both positive and negative consider $\gamma \rightarrow 0$ and $\gamma \rightarrow \gamma_{max}$ and $\rho \rightarrow -1$).

Part (iii): The magnitude of discretionary accruals is smaller when the forecast error is positive than when the forecast error is negative. If $E[\widetilde{DA}|\widetilde{FE} > 0, \tau] > 0$, then:

$$|E[\widetilde{DA}|\widetilde{FE} > 0, \tau]| < |E[\widetilde{DA}|\widetilde{FE} < 0, \tau]|$$

$$\frac{p_2}{c_2} - \frac{r_1}{\tau}\,\frac{\phi\left(-\frac{\sqrt{\tau}}{r_2}\left(\frac{p_2}{c_2}-\frac{p_1}{c_1}\right)\right)}{1-\Phi\left(-\frac{\sqrt{\tau}}{r_2}\left(\frac{p_2}{c_2}-\frac{p_1}{c_1}\right)\right)} < \frac{p_2}{c_2} + \frac{r_1}{\tau}\,\frac{\phi\left(-\frac{\sqrt{\tau}}{r_2}\left(\frac{p_2}{c_2}-\frac{p_1}{c_1}\right)\right)}{\Phi\left(-\frac{\sqrt{\tau}}{r_2}\left(\frac{p_2}{c_2}-\frac{p_1}{c_1}\right)\right)}.$$

If $E[\widetilde{DA}|\widetilde{FE} > 0, \tau] < 0$, then:

$$|E[\widetilde{DA}|\widetilde{FE} > 0, \tau]| < |E[\widetilde{DA}|\widetilde{FE} < 0, \tau]|$$

$$\frac{r_1}{\tau}\,\frac{\phi\left(-\frac{\sqrt{\tau}}{r_2}\left(\frac{p_2}{c_2}-\frac{p_1}{c_1}\right)\right)}{1-\Phi\left(-\frac{\sqrt{\tau}}{r_2}\left(\frac{p_2}{c_2}-\frac{p_1}{c_1}\right)\right)} - \frac{p_2}{c_2} < \frac{p_2}{c_2} + \frac{r_1}{\tau}\,\frac{\phi\left(-\frac{\sqrt{\tau}}{r_2}\left(\frac{p_2}{c_2}-\frac{p_1}{c_1}\right)\right)}{\Phi\left(-\frac{\sqrt{\tau}}{r_2}\left(\frac{p_2}{c_2}-\frac{p_1}{c_1}\right)\right)}$$

$$\frac{r_1}{\tau}\,\phi\left(-\frac{\sqrt{\tau}}{r_2}\left(\frac{p_2}{c_2}-\frac{p_1}{c_1}\right)\right)\frac{2\Phi\left(-\frac{\sqrt{\tau}}{r_2}\left(\frac{p_2}{c_2}-\frac{p_1}{c_1}\right)\right)-1}{\left[1-\Phi\left(-\frac{\sqrt{\tau}}{r_2}\left(\frac{p_2}{c_2}-\frac{p_1}{c_1}\right)\right)\right]} < 0 < \frac{2p_2}{c_2}$$

which follows from $\frac{p_2}{c_2} - \frac{p_1}{c_1} > 0$ (see proof of Corollary 3). ■

Proof of Corollary 2

Part (a). From Equation (8) and $p_3 < 0$ it follows that

$$\frac{\partial r_2}{\partial c_2} = \frac{1}{2}\,\frac{\frac{\sqrt{c_2}}{2\sqrt{c_2+8p_3}} - \frac{\sqrt{c_2+8p_3}}{2\sqrt{c_2}}}{c_2} = \frac{-8p_3}{4c_2\sqrt{c_2^2+8c_2p_3}} > 0.$$

Part (b). From Equation (8) $\frac{\partial r_2}{\partial \gamma} = \frac{\partial r_2}{\partial p_3} * \frac{\partial p_3}{\partial \gamma}$ where $\frac{\partial p_3}{\partial \gamma} = -\gamma\frac{\theta_2}{1+k_2}\frac{1}{2\alpha-1} < 0$ and $\frac{\partial r_2}{\partial p_3} = \frac{1}{4}\frac{8}{\sqrt{c_2^2+8c_2p_3}} > 0$. Hence, $\frac{\partial r_2}{\partial \gamma} < 0$. Similarly, $\frac{\partial r_2}{\partial \alpha} > 0$ because

$$\frac{\partial p_3}{\partial \alpha} = 2\gamma\frac{\theta_2}{1+k_2}\frac{1}{(2\alpha-1)^2} > 0.$$

Part (c). $\frac{\partial r_2}{\partial \rho} = \frac{\partial r_2}{\partial p_3}\frac{\partial p_3}{\partial \rho} = -\frac{\partial r_2}{\partial p_3}\,\gamma\,\frac{2(1+\rho)\frac{k_2}{1+k_2} - 2\rho}{1+k_2}\,\frac{1}{2\alpha-1}$. Since $\frac{\partial r_2}{\partial p_3} > 0$

it follows that *sign* $\left(\frac{\partial r_2}{\partial \rho}\right) = sign(\rho - k_2)$. Hence for $k_2 = 0$ we have *sign* $\left(\frac{\partial r_2}{\partial \rho}\right) = sign(\rho)$. ■

Proof of Corollary 3

Part (a). With $r_0 = \frac{p_2}{c_2} - r_1 \frac{p_1}{c_1}$, $MF = \mu_1 + \frac{p_1}{c_1}$, and $r_1 + r_2 = 1$ the forecast bias yields $E[FE] = E[r_0 + r_1 MF + r_2 x_1 - MF] = \frac{p_2}{c_2} - \frac{p_1}{c_1}$. Making use of the result in Corollary 1 part (a) that $r_2 < 1$ it follows that:

$$\begin{aligned}\frac{p_2}{c_2} - \frac{p_1}{c_1} &= \frac{1+\rho}{1+k_2}\frac{1}{c_2 r_2} - \frac{1+\rho}{c_1}\left(\frac{1}{1+k_1} - \frac{1}{(1+k_2)r_2}\right)\\ &= \frac{1+\rho}{1+k_2}\frac{1}{r_2}\left(\frac{1}{c_2} + \frac{1}{c_1}\left(1 - \frac{1+k_2}{1+k_1}r_2\right)\right).\end{aligned}$$

From $k_2 \leq k_1$ and $r_2 < 1$ it follows that $\frac{1+k_2}{1+k_1} r_2 < 1$ and hence $E[FE] > 0$.

Part (b). The investors' risk-aversion enters the manager's forecasting and reporting strategy only through the magnitude of the pricing coefficient p_3 that affects r_2.

$$\begin{aligned}\frac{\partial E[FE]}{\partial p_3} &= \frac{\partial}{\partial p_3}\left[\frac{1+\rho}{1+k_2}\frac{1}{r_2}\left(\frac{1}{c_2} + \frac{1}{c_1}\left(1 - \frac{1+k_2}{1+k_1}r_2\right)\right)\right]\\ &= -\frac{1}{r_2}\left(\frac{p_2}{c_2} - \frac{p_1}{c_1}\right)\frac{\partial r_2}{\partial p_3} - \frac{1+\rho}{1+k_2}\frac{1}{r_2}\frac{1}{c_1}\frac{1+k_2}{1+k_1}\frac{\partial r_2}{\partial p_3}.\end{aligned}$$

From $k_2 \leq k_1$ it follows that $\frac{p_2}{c_2} - \frac{p_1}{c_1} > 0$ (see part (a)) and hence $\frac{\partial E[FE]}{\partial p_3} < 0$. Since $\frac{\partial p_3}{\partial \gamma} < 0$ it follows that $\frac{\partial E[FE]}{\partial \gamma} > 0$.

Part (c). Following the same line of argument, $\frac{\partial E[FE]}{\partial \alpha} = \frac{\partial E[FE]}{\partial p_3}\frac{\partial p_3}{\partial \alpha} < 0$.

Proof of Corollary 4

We know from the proof of Corollary 3 that $E[FE] = \frac{p_2}{c_2} - \frac{p_1}{c_1}$. Taking the derivative with respect to ρ yields:

$$\begin{aligned}\frac{\partial E[FE]}{\partial \rho} &= \frac{\partial}{\partial \rho}\left(\frac{p_2}{c_2} - \frac{p_1}{c_1}\right) = \frac{\partial}{\partial \rho}\left(\frac{1+\rho}{1+k_2}\frac{1}{r_2}\left(\frac{1}{c_2} + \frac{1}{c_1}\left(1 - \frac{1+k_2}{1+k_1}r_2\right)\right)\right)\\ &= -\frac{1}{c_1}\frac{1}{1+k_1} + \frac{1}{1+k_2}\frac{1}{r_2}\left(\frac{1}{c_2} + \frac{1}{c_1}\right)\left(1 + \frac{2(1-r_2)}{2r_2 - 1}\frac{(k_2-\rho)(1+\rho)}{(1+k_2)\theta_2}\right).\end{aligned}$$

Suppose $k_1 \geq k_2$. If $k_1 \geq k_2$, it follows that $E[FE] > 0$ (see Corollary 3, part (a)). From Corollary 2 we know that *sign* $\left(\frac{\partial r_2}{\partial \rho}\right) = sign(\rho - k_2)$.

Part (i). $\rho \leq k_2$: If $\rho \leq k_2$, then $\frac{\partial r_2}{\partial \rho} < 0$ and hence $\frac{\partial E[FE]}{\partial \rho} > 0$.

Part (ii). $\rho > k_2$: If $\frac{1}{r_2}\left(1 - \frac{1+\rho}{1+k_2}\frac{\partial r_2}{\partial \rho}\right) = \left(1 - \frac{2(1-r_2)}{2r_2-1}\frac{(\rho-k_2)(1+\rho)}{(1+k_2)\theta_2}\right) \leq 0$, then $\frac{\partial E[FE]}{\partial \rho} < 0$.

$$1 - \frac{2(1-r_2)}{2r_2-1}\frac{(\rho-k_2)(1+\rho)}{(1+k_2)\theta_2} \leq 0$$

$$8\frac{\gamma}{c_2}\frac{\theta_2}{1+k_2}\frac{1}{2\alpha-1} \geq 1 - \left(\frac{(\rho-k_2)(1+\rho)}{(1+k_2)\theta_2 + (\rho-k_2)(1+\rho)}\right)^2. \tag{13}$$

Since the RHS always exceeds 1, for γ sufficiently close to γ^{max} such that $r_2 \rightarrow \frac{1}{2}$ the inequality holds and $\frac{\partial E[FE]}{\partial \rho} < 0$. If the condition in Equation (13) does not hold, then $\exists k_1^* > k_2$ such that for $k_1 > k_1^*$ $\frac{\partial E[FE]}{\partial \rho} > 0$.

For $k_1 = k_2 = 0$ the inequality in Equation (13) is equivalent to $\left(1 - \frac{2(1-r_2)}{2r_2-1}\frac{\rho}{1-\rho}\right) \leq 0$ and yields $\gamma \geq \frac{c_2(2\alpha-1)}{8}$. Hence:

$$\frac{\partial E[FE]}{\partial \rho} = -\frac{1}{c_1} + \frac{1}{r_2}\left(\frac{1}{c_2} + \frac{1}{c_1}\right)\left(1 - \frac{2(1-r_2)}{2r_2-1}\frac{\rho}{1-\rho}\right)$$

is negative if $\rho > 0$ and $\gamma \geq \frac{c_2(2\alpha-1)}{8}$. If $\gamma < \frac{c_2(2\alpha-1)}{8}$, then there exists $\rho^*\left(\frac{8\gamma}{c_2(2\alpha-1)}\right)$ such that for $\rho < \rho^*\left(\frac{8\gamma}{c_2(2\alpha-1)}\right)$ the above inequality is satisfied and $\frac{\partial E[FE]}{\partial \rho} > 0$ where $\rho^*\left(\frac{8\gamma}{c_2(2\alpha-1)}\right)$ is the maximum of the unique positive solution to $\frac{8\gamma}{c_2(2\alpha-1)} = \frac{1-3\rho}{(1-\rho)^2}$ and 0. If $\rho > \rho^*\left(\frac{8\gamma}{c_2(2\alpha-1)}\right)$, then we have $\frac{1}{r_2}\frac{2r_2-1-\rho}{(2r_2-1)(1-\rho)} < 1$. Solving for the condition such that $\frac{\partial E[FE]}{\partial \rho}$ is still positive yields $c_1 > \left(\frac{r_2(2r_2-1)(1-\rho)}{2r_2-1-\rho} - 1\right)c_2 > 0$. Let $c_1^*\left(\frac{8\gamma}{c_2(2\alpha-1)}, \rho\right) \equiv \left(\frac{r_2(2r_2-1)(1-\rho)}{2r_2-1-\rho} - 1\right)c_2 > 0$. Then for all $c_1 > c_1^*\left(\frac{8\gamma}{c_2(2\alpha-1)}, \rho\right)$ we have $\frac{\partial E[FE]}{\partial \rho} > 0$ and for $c_1 \leq c_1^*\left(\frac{8\gamma}{c_2(2\alpha-1)}, \rho\right)$ we have $\frac{\partial E[FE]}{\partial \rho} \leq 0$. ■

Proof of Corollary 5

Part (a). The average difference in stock market reaction is $E[p_2 + p_3(\tilde{y}_{x1} - \tilde{y}_{\mu 1})] - \frac{1 + \rho}{1 + k_1} = p_2 - \frac{1 + \rho}{1 + k_1} = \frac{1 + \rho}{1 + k_2}\frac{1}{r_2} - \frac{1 + \rho}{1 + k_1} \geq \frac{1 + \rho}{1 + k_2}\left(\frac{1}{r_2} - 1\right)$ where the inequality follows from $k_2 \leq k_1$. From part (a) of Corollary 1 we know that $r_2 < 1$ and hence $\frac{1 + \rho}{1 + k_2}\left(\frac{1}{r_2} - 1\right) > 0$.

Part (b). Part (b) of Corollary 2 establishes that $\frac{\partial r_2}{\partial \gamma} < 0$, $\frac{\partial r_2}{\partial \alpha} > 0$ and $\frac{\partial r_2}{\partial c_2} > 0$. Hence, the average difference in stock market reaction, $\frac{1 + \rho}{1 + k_2}\frac{1}{r_2} - \frac{1 + \rho}{1 + k_1}$, is increasing in γ and decreasing in α and c_2.

Part (c). We want to show that:

$$\frac{\partial}{\partial \rho}\left(p_2 - \frac{\partial P(MF)}{\partial MF}\right)\begin{cases} \geq 0 & \text{if } \rho \geq k_2 \text{ and } (\gamma - \gamma^* \text{ or } \gamma \leq \gamma^* \text{ and } k_1) \\ < 0 & \text{otherwise.} \end{cases}$$

Taking the derivative of p_2 with respect to ρ yields:

$$\frac{\partial p_2}{\partial \rho} = \frac{\partial}{\partial \rho}\frac{1 + \rho}{1 + k_2}\frac{1}{r_2} = \frac{1}{1 + k_2}\left(\frac{1}{r_2} - (1 + \rho)\frac{1}{r_2^2}\frac{\partial r_2}{\partial \rho}\right) = \frac{1}{1 + k_2}\frac{1}{r_2}\left(1 - \frac{1 + \rho}{r_2}\frac{\partial r_2}{\partial \rho}\right)$$

and:

$$\frac{\partial}{\partial \rho}\left(p_2 - \frac{\partial P(MF)}{\partial MF}\right) = \frac{\partial}{\partial \rho}\left(p_2 - \frac{1 + \rho}{1 + k_1}\right) = \frac{1}{1 + k_2}\frac{1}{r_2}\left(1 - \frac{1 - \rho}{r_2}\frac{\partial r_2}{\partial \rho}\right) - \frac{1}{1 + k_1}.$$

We know from Corollary 4 that $\left(1 - \frac{1 + \rho}{r_2}\frac{\partial r_2}{\partial \rho}\right) > 0$ if either $\rho \leq k_2$ or $\rho > k_2$ and $\gamma < \gamma^*$. Hence, if $\rho > k_2$ and $\gamma \geq \gamma^*$, then $\frac{\partial}{\partial \rho}\left(p_2 - \frac{\partial P(MF)}{\partial MF}\right) \leq 0$. Otherwise, there exists k_1^* sufficiently high such that $\frac{\partial}{\partial \rho}\left(p_2 - \frac{\partial P(MF)}{\partial MF}\right) > 0$.

For $k_1 = k_2 = 0$.

$$\begin{aligned}\frac{\partial}{\partial \rho}\left(p_2 - \frac{\partial P(MF)}{\partial MF}\right) &= \frac{\partial}{\partial \rho}(p_2 - (1 + \rho)) = \frac{\partial p_2}{\partial \rho} - 1 \\ &= \frac{1}{r_2(2r_2 - 1)}\left[-2r_2^2 + r_2\frac{3 - \rho}{1 - \rho} - \frac{1 + \rho}{1 - \rho}\right].\end{aligned}$$

We know that $r_2 \in \left(\frac{1}{2}, 1\right)$. Hence, $\frac{1}{r_2(2r_2 - 1)} > 0$. Since $r_2 < 1$ and $p_3 < 0$ it follows that for $\rho < 0$ $\frac{\partial}{\partial \rho}(p_2 - (1 + \rho)) > 0$. Solving $\left[-2r_2^2 + \frac{3 - \rho}{1 - \rho}r_2 - \frac{1 + \rho}{1 - \rho}\right] = 0$ for r_2

yields $r_2 = \frac{3 - \rho \pm (1 - 3\rho)}{4(1 - \rho)}$ or $r_2 \in \left\{\frac{1 + \rho}{2(1 - \rho)}, 1\right\}$. Hence, $\left[-2r_2^2 + \frac{3 - \rho}{1 - \rho} r_2 - \frac{1 + \rho}{1 - \rho}\right] > 0$ if $r_2 \in \left(\frac{1 + \rho}{2(1 - \rho)}, 1\right)$ and $\rho < \frac{1}{3}$ $\left(\text{note that } \rho < \frac{1}{3} \text{ implies that } \frac{1 + \rho}{2(1 - \rho)} < 1\right)$ and $\left[-2r_2^2 + \frac{3 - \rho}{1 - \rho} r_2 - \frac{1 + \rho}{1 - \rho}\right] < 0\ \forall r_2 \in \left(\frac{1}{2}, 1\right)$ if $\rho > \frac{1}{3}$. $r_2 > \frac{1 + \rho}{2(1 - \rho)}$ is equivalent to $\gamma < \frac{(1 + \rho)(1 - 3\rho)}{(1 - \rho)^2} \frac{(2\alpha - 1)c_2}{8(1 - \rho^2)}$. Note that $\frac{(1 + \rho)(1 - 3\rho)}{(1 - \rho)^2} < 1$ (otherwise it would not be a restriction to the condition $\gamma < \frac{(2\alpha - 1)c_2}{8(1 - \rho^2)}$ in Proposition 1). ■

Proof of Proposition 2

Part (a). Since $r_1, r_2 \in (0, 1)$ and $p_1 = -(1 + \rho)\frac{r_1}{r_2}$ it follows that $p_1 < 0$.

Part (b). Let $P(R, R + \Delta)$ be the stock price after a negative surprise Δ at the earnings announcement:

$$\begin{aligned} P(R, R + \Delta) &= p_0 + p_1(R + \Delta) + p_2 R + p_3 \\ &\quad \left(\frac{R - (r_0 + r_1(R + \Delta))}{r_2} - R - \Delta + m_0\right)^2 \\ &= p_0 + (1 + \rho)R + p_1\Delta + p_3\left(-\frac{r_0 + \Delta}{r_2} - m_0\right)^2. \end{aligned}$$

Controlling for the magnitude of surprise (Δ) and the level of reported earnings, the difference in market value following a positive surprise ($MF = R - \Delta$) and a negative surprise ($MF = R + \Delta$) is:

$$\begin{aligned} P(R, R - \Delta) - P(R, R + \Delta) &= \left[p_0 + (1 + \rho)R - p_1\Delta + p_3\left(-\frac{r_0 - \Delta}{r_2} + m_0\right)^2\right] \\ &\quad - \left[p_0 + (1 + \rho)R + p_1\Delta + p_3\left(-\frac{r_0 + \Delta}{r_2} + m_0\right)^2\right] \\ &= -2p_1\Delta - 4\frac{p_3}{r_2^2}\Delta\left(\frac{p_2}{c_2} - \frac{p_1}{c_1}\right) > 0 \end{aligned}$$

where the inequality follows from $p_1, p_3 < 0$, and $p_2, r_2 > 0$.

Part (c).

$$\frac{\partial P(R, R - \Delta) - P(R, R + \Delta)}{\partial \Delta} = -2p_1 - 4\frac{p_3}{r_2^2}\left(\frac{p_2}{c_2} - \frac{p_1}{c_1}\right) > 0. \qquad ■$$

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Organizational Design and Control across Multiple Markets: The Case of Franchising in the Convenience Store Industry

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ABSTRACT: Many companies operate units that are dispersed across different types of markets, serving significantly divergent customer bases. Such dispersion is likely to compromise headquarters' ability to control local managers' behavior and satisfy the needs of different customer types. In this study we find that market-type dispersion is an important determinant of the delegation of decision rights and the provision of incentives. Using a sample of convenience store chains, we show that market-type dispersion is positively associated with the degree of franchising at the chain level as well as the probability of franchising a given store within a chain. Our results are robust to alternative definitions of market-type dispersion and to other determinants of franchising such as the stores' geographic dispersion. Additional analyses suggest that chains that do not franchise cope with market-type dispersion by decentralizing operations from headquarters to their stores and providing their store managers higher variable pay.

Keywords: *control; organizational design; market dispersion; decentralization; incentives; franchising; retailing.*

JEL Classifications: *D82; D86; L22; M41.*

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I. INTRODUCTION

Many companies operate multiple business units that serve widely diverse market (i.e., customer) types. Companies expand into different markets for many reasons, e.g., to leverage the organization's competencies, to diversify risks, to strengthen the company's brand name, to achieve economies of scale. The most common type of organization to serve multiple markets is a chain. For example, a bank may diversify risks by offering credit and savings services to different communities; a hotel may achieve economies of scale by operating in different countries; and a supermarket may replicate its basic business model by opening multiple stores in markets that serve a broad range of customers. Long-standing research points to the potential for significant coordination and control challenges in such firms (Chase 1981, 1983; Karmarkar and Pitbladdo 1995; Mittal et al. 2004). However, despite the considerable body of accounting research on organizational design for business units (e.g., Abernethy et al. 2004; Baiman et al. 1995; Bushman et al. 1995; Nagar 2002), there has been a lack of research investigating how managers respond to these challenges via organizational design choices. In this study we seek to fill this void. Defining the variation in customer demand faced by an organization operating across different locations as *market-type dispersion,* we study this phenomenon as both a determinant and an outcome of firms' organizational design choices.

We focus on market-type dispersion because it is a ubiquitous characteristic of many organizations that theoretically gives rise to two primary control problems. First, from a corporate perspective, relative differences in local conditions make it more difficult for a firm's headquarters to monitor and control managers serving different markets (Landier et al. 2006). Control problems can arise, for example, from uncertainty at the headquarters level regarding how to set benchmarks for monitoring and evaluating the performance of local managers serving very different customers across heterogeneous markets. Second, from a demand perspective, a company with a wide-ranging customer base will have greater challenge appealing to, and configuring its operations to profitably serve, all its customers while also maintaining uniformity across units to preserve the integrity of the firm's trademark (Anderson and Mittal 2000; Bradach 1997; Chase 1983). Firms can alleviate these control problems either by limiting expansion to relatively uniform types of markets or by delegating decision-making authority and providing incentives to local managers (Baiman et al. 1995).

Our primary empirical tests focus on franchising as a proxy for the extent to which firms rely on the delegation of decision rights and the provision of incentives to minimize control problems arising from market-type dispersion. Based on previous literature on management control and interviews with retail-chain managers, we argue that franchising: (1) simultaneously achieves delegation of decision rights and provision of high-powered incentives; (2) attracts and allocates risk more efficiently to business unit managers with superior local knowledge (Jensen and Meckling 1992; Prendergast 2002); and (3) allows the organization to balance the need to customize to local markets with the need to preserve uniformity across business units (Jensen and Meckling 1992).[1] Using a unique database covering all stores operated by convenience store chains in the U.S., we examine whether a positive relationship exists between market-type dispersion and organizational design choices including ownership structure (e.g., franchising), degree of decentralization, and the use of incentive pay. We conduct analyses at both the organization (i.e., chain) and business unit (i.e., store) levels.

At the chain level, we find that market-type dispersion is positively associated with the decision to franchise stores as well as the extent to which franchising is used. When we estimate a simultaneous equations model, we further find that market-type dispersion is both a determinant and an outcome of the franchising decision. This latter finding suggests that organizational design choices are both a response to, and facilitate a strategy of, expansion into divergent markets. Our chain-level tests also indicate that *non-franchisor* chains with higher market-type dispersion decentralize operations more extensively than those with lower market-type dispersion and provide higher variable pay to their store managers. These results are robust to other determinants explored in the literature including monitoring costs arising from the chain's geographic dispersion (Brickley and Dark 1987; Norton 1988) and chain size (Caves and Murphy 1976; Lafontaine 1992).

In our store-level analyses, we use a fixed-effects logit model to explore the decision to franchise or not franchise individual stores as a function of the store's *market-type divergence* (i.e., the extent to which a store's market characteristics diverge from the most prevalent characteristics of the chain as a whole). We find evidence supporting an association between the decision to franchise and the store's market-type divergence that is robust to chain fixed effects, store demographic characteristics, and across subsamples of chains with different financing and expansion histories. These findings are consistent with chains *systematically* choosing franchising as a control mechanism for individual stores when market-type divergence is high and rule out alternative explanations for our chain-level results such as franchising and market-type dispersion simply coinciding with an unobservable "aggressive" expansion strategy.

Our study makes several contributions to the literature in accounting that describes organizational design solutions to broad control problems emerging from business unit interdependencies, information asymmetries, product diversity, growth, and environmental uncertainty (Abernethy et al. 2004; Baiman et al. 1995; Bushman et al. 1995; Moers 2006; Nagar 2002; Widener et al. 2008). First, we recognize market-type dispersion as a prevalent and important operating decision made by a firm that gives rise not only to agency problems, but also to operational control problems in multi-market organizations, and we develop several measures of this new construct. Second, using these measures we demonstrate that market-type dispersion is an important determinant of organizational design, a relation that is not recognized in prior literature. Third, unlike prior research that tends to treat characteristics of firm operating environments as exogenous determinants of organizational design choices (Abernethy et al. 2004; Bushman et al. 1995; Nagar 2002), we show that the firm's decision to expand into diverse markets is also an outcome of organizational design choices. Finally, in contrast to prior accounting research that has tested theories of business-unit organizational design using data collected only at the organizational level (Bushman et al. 1995; Nagar 2002) or based on cross-sectional differences in individual business units from different organizations (Abernethy et al. 2004; Widener et al. 2008), our findings reveal *within-firm* variation in organizational design choices in response to the local operating environment of individual business units.

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[1] As the Chief Operating Officer of a large convenience store chain in the Northeast U.S. explains, "Franchisees are more entrepreneurial and would have more control over difficult situations such as adapting merchandising to local market conditions, and managing theft, shrinkage, and other aspects required to maintain performance."

Our study also contributes to the literature related to franchising in geographically dispersed chain organizations. While several economics studies have found that franchising agreements are used by chains to decrease agency costs in geographically dispersed locations (Brickley and Dark 1987; Brickley et al. 1991; Norton 1988), our study examines the decision to franchise in the context of market-type dispersion.[2] A chain experiencing high market-type dispersion is less able to transfer knowledge from one store to another, regardless of geographic proximity. Franchising allows the firm not only to decrease agency costs in unfamiliar markets, but also to balance customization to unique customer demands and uniformity across its different units. We show that the level of market-type dispersion in a chain plays a significant role in the chain's decision to franchise its units, over and above geographic dispersion. Our study sheds light on Fladmoe-Lindquist and Jacque's (1995) finding that the propensity to franchise internationally is not only related to geographical distance, but also to "cultural" distance between the franchisor and its foreign franchisees.[3]

Section II develops our hypotheses while Section III describes the sample selection. Section IV describes the market dispersion measures utilized in our analyses, and Section V presents our chain-level and store-level empirical analyses as well as additional analyses on non-franchisor chains. Section VI concludes.

II. THEORETICAL BACKGROUND AND HYPOTHESIS DEVELOPMENT

Control Challenges Associated with Market-Type Dispersion

Expansion into different markets may allow efficient chain organizations to strengthen (and derive economic rents from) their brand name; leverage their expertise and managerial skills; take advantage of economies of scale; and exploit the benefits of risk diversification (Berger and DeYoung 2001). However, serving multiple markets may also result in negative consequences for the chain. Expansion into diverse markets can create greater uncertainty and reduce efficiencies as the relative expertise of headquarters is diminished *vis-à-vis* store management in controlling store operations (Baiman et al. 1995). Specifically, an increase in a chain's market-type dispersion generates two major control problems from the headquarters' perspective, as described below.

Greater Agency Conflicts from Monitoring

The headquarters[4] of a chain confronts an agency problem if the store managers' actions do not reflect the best interests of the company as a whole. Monitoring store managers across highly dispersed types of markets is a challenging task due to the difficulty in setting performance benchmarks that would appropriately account for the distinctive environments in which each manager operates. As such, greater market-type dispersion impairs the headquarters' ability to limit opportunistic store managers from engaging in shirking or perquisite-taking (Jensen and Meckling 1976) and from providing a lower-quality service while free-riding on the chain's brand name (Brickley and Dark 1987). Thus, chains with stores serving heterogeneous markets experience more information asymmetries between the store managers and the chains' headquarters than chains that are geographically dispersed but serve similar types of customers (Landier et al. 2006).

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[2] Note that market dispersion is not necessarily associated with geographic dispersion because (1) a company's units can be close to each other geographically but still have sharply divergent types of customers (e.g., stores in the ethnic neighborhoods of Chicago serve customers of different ethnicities, despite being a few blocks apart), and (2) a company's units can be geographically distant among each other and yet have similar customer bases.

[3] Fladmoe-Lindquist and Jacque (1995) capture "cultural distance" using a set of dummy variables indicating whether the foreign franchisees are located in one of six areas: Latin Europe, Nordic/Germany, Far East, Near East/Arabic, Latin America/Caribbean, and Independent country clusters. The Anglo area is utilized as the baseline.

[4] We assume the headquarters' interests represent the interests of the owners of the chain (i.e., maximizing value).

Greater Difficulties Serving Customers in Different Markets

Chains serving customers with similar preferences are able to transfer operating knowledge across geographically dispersed locations. In contrast, chains operating stores in highly diverse markets need to adapt to the tastes of divergent customers.[5] Thus, a chain serving a diversity of markets will need to attract store managers with market-sensing and entrepreneurial skills and motivate them to increase their efforts to adapt to the tastes of local customers while coordinating their actions with those of the chain headquarters to maintain a level of uniformity that will preserve the value of the company's trademark (Bradach 1997).

Organizational Design Choices for Managing Market-Type Dispersion

The headquarters of a chain can control the actions of store managers by (1) increasing the level of ratification and monitoring of the decisions made by the store managers (Fama and Jensen 1983), or (2) delegating decision rights to the store managers while providing high-powered output-based incentives that align the store managers' interests to those of the chain (Baiman et al. 1995; Fama and Jensen 1983; Prendergast 2002). For a chain with high levels of market-type dispersion, the benefits of directing and monitoring the store managers' actions may be hampered by the high costs of gathering market-specific data to achieve this goal, since the information collected and analyzed in one location will probably be useless at other locations.

A more efficient use of information will result if the chain delegates decision rights to its store managers (Baiman et al. 1995; Jensen and Meckling 1992; Nagar 2002). However, the delegation of decision rights should be complemented with incentives to ensure that the store managers do not misuse authority (Nagar 2002; Prendergast 2002). A firm may provide store managers with incentives by either tying their compensation to store performance or selling them the residual claims of the units. Both types of incentives are likely to motivate store managers to maximize economic value, but both solutions generate costs. Tying store managers' compensation to store performance could be inefficient since such managers tend to lack entrepreneurial skills and to be risk-averse, requiring a high premium for managing a store in an uncertain market environment. The second solution, where a store manager purchases all the residual claims of its units, is unlikely, as a chain benefits from retaining certain decision rights, particularly those related to the protection of its brand (Brickley and Dark 1987; Jensen and Meckling 1992).

Franchising provides an intermediate solution that achieves both delegation of decision rights and provision of incentives without requiring that the chain give up all its decision rights or pay a disproportionately high premium to any store manager running a divergent store (i.e., a store in a market the chain does not traditionally serve). Based on previous research and discussions with executives of convenience stores, we argue that chains should choose to delegate decision rights and provide high-powered incentives via franchising to solve control problems in divergent stores. First, franchising agreements attract store managers who possess the entrepreneurial and market-sensing skills needed to operate stores with high market-type divergence (Bradach 1997) and, hence, who are better able to bear risk compared to the average store manager. Second, in many cases, franchisees view the risk of operating these stores to be much lower than the risk perceived by the chain. Chains see these stores as more risky because their standard operating procedures and control mechanisms are not suitable for the stores in these markets. Franchisees have no such issues. Third, franchising agreements limit franchisees' shirking behavior and motivate franchisees to exert the necessary effort to adapt to local needs and provide a high-quality service, as the franchisees retain the residual profits from their units. Finally, franchising is a coordinating mechanism, since it allows the chain to retain a few decision rights that are necessary to maintain the quality and consistency of the brand by imposing a set of guidelines to operate the brand (pricing, product mix selection, etc.), controlling the level of advertising, and retaining the right to terminate the franchise agreement if the franchisee violates the chain's conditions to operate the brand (Brickley and Dark 1987). Thus, franchising serves as an efficient control mechanism in the face of market-type dispersion.

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[5] A number of studies in marketing and operations management provide evidence that different types of customers place different importance on the attributes that lead to customer satisfaction and consumption in chain organizations (Anderson and Mittal 2000; Mittal et al. 2004). For instance, Mattila (1999) finds that the importance customers place on the physical environment attribute of luxury hotels is associated with their ethnicity; Mittal et al. (2004) finds that customers' responsiveness to automobile dealership services varies with their income, age, education, and ethnicity; while Campbell and Frei (2006) find that local market characteristics across bank branches, such as income, are significant determinants of customer responsiveness to service capacity investments.

Although franchising offers superior benefits over other mechanisms that could be used to solve control problems in chains with high levels of market-type dispersion, there are several factors that may render franchising unattractive. First, franchisees in market-divergent stores may worry that the actions taken by the franchisor to advertise the brand, introduce products, or manage supplies would be tailored to the most common markets served by the chain. This concern is mitigated to the extent that the chain desires to build a reputation as a good franchisor and to be responsive to the franchisee's needs to adapt to different conditions. Second, franchising imposes undiversified risks on store managers (Lafontaine and Slade 1997). Third, franchising could create hold-up problems where franchisees may underinvest in their stores given that the franchisor has the option to take away their franchise (Shane 1998). If, despite these costs, chains franchise some stores, then we expect the benefits of franchising to be greater in chains that operate stores dispersed across different types of markets. More formally:

> **H1:** A chain's decision to franchise some or all of its stores will be positively associated with the extent to which its stores are dispersed across different types of markets.

A potential limitation in testing H1 is that the decision to expand into new markets resides with the chain headquarters. Thus, a chain-level analysis may suffer from endogeneity due to (1) correlated omitted variables (i.e., there may be one or more unobserved variables, such as the value of the chain's brand, that may explain both the decision to franchise and the decision to expand into new markets, and thus may be the reason we find a correlation between franchising and market-type dispersion), or (2) reverse causality (i.e., it may not be clear whether market-type dispersion leads to more franchising, or a chain's decision to franchise affects the headquarters' decision to expand into new markets). These endogeneity concerns are mitigated if we test franchising decisions at the store level while controlling for chain fixed effects.

At the store level, control problems become more severe for stores that operate in markets with marked differences from the predominant market characteristics in the chain as a whole. Thus, conditional on a chain's decision to franchise some, but not all of its stores, we test:

> **H2:** Chains franchising some, but not all of their stores are more likely to franchise units in locations where market characteristics diverge more from the most prevalent location characteristics in each chain as a whole.

III. SAMPLE DESCRIPTION

We conduct our analyses using data on the convenience store industry. According to the National Association of Convenience Stores (NACS), convenience stores are typically stores smaller than 5,000 square feet, with off-street parking and/or convenient pedestrian access, extended hours of operation, and a broad selection of products including grocery-type items, beverages, snacks, and tobacco.

Convenience store retailers operate stores under both franchising and company ownership arrangements. Not surprisingly, franchising involves more delegation of decision rights as well as significantly higher amounts of variable pay. Franchise contracts in this industry typically involve a fixed, up-front franchise fee and royalty rates that vary from 4 to 6 percent of sales,[6] with the individual franchisees remaining as the residual claimants of the profits of units under their control.[7] In contrast, for company-owned units in this industry, variable pay accounts only for 12.7 percent of total annual compensation of store managers on average.[8]

We focus on this industry for several reasons. First, for empirical analysis, the heterogeneity of markets that a convenience store chain faces varies widely across chains and can be proxied by the variation in the location demographic characteristics of the chains' stores. Second, convenience store chains essentially compete on location and are relatively undifferentiated in other dimensions,[9] reducing the number of factors to be considered for empirical analysis. Third, focusing on a relatively homogeneous industry allows us to control for industry-specific conditions such as the degree of regulation or the extent to which store managers engage in chain-specific investments affecting governance and monitoring costs (Williamson 1985).

We use two different data sources for our analyses: the convenience stores data set from the TDLinx 2004 Channel Database licensed to and facilitated by NACS, which includes the location (address) and ownership composition (whether each store is franchised) of all convenience stores in the United States,[10] and the Environmental Systems Research Institute (ESRI) 2004 Business Location Data, which tracks the locations of all business entities in the United States as well as demographic information from the 2000 U.S. Census.

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[6] Blair and Lafontaine (2005, 54) report that the royalty rate and franchise fee combinations are "remarkably uniform within chains and thus insensitive to variations in individual, outlet, and specific market conditions." Based on survey data, they also indicate that 73 percent of the franchisors adopt uniform contracts because they perceive them to be consistent and fair to the franchisees, while the other 27 percent argues that the reason to use uniform contracts is to minimize transaction costs.

[7] Details on individual franchise contract terms for convenience store retailers can be found in *Entrepreneur Magazine*.

[8] Data for this calculation come from the underlying data for the 2004 National Association of Convenience Store Retailers Annual Compensation Survey.

[9] Convenience stores typically operate in a mature, competitive environment with competition from other convenience stores, grocery stores, gasoline retailers, and drug stores. Larger chains tend to focus heavily on maintaining consistent standards of execution across stores. The traditional operating strategy in the convenience store industry focuses on offering fast and efficient service, clean surroundings, and a broad product selection.

We analyze the extent to which market-type dispersion affects franchising decisions at the chain level using data from 420 convenience store chains with at least 20 stores each (i.e., we exclude "mom and pop" convenience stores), and at the store level using data from 34,892 stores from the subset of 43 chains (out of the 420) that own some stores and franchise others.

Notice that the latest U.S. Census was taken in 2000, while the TDLinx data correspond to 2004. As a result, the store location characteristics are lagged measures with respect to chain characteristics. Since the four-year difference between the data sets is a relatively short period of time, population movements have most likely introduced random, rather than systematic, noise. Thus, this time difference should not bias the results of our analyses.

IV. MEASUREMENT OF MARKET-TYPE DISPERSION AND DIVERGENCE

Market-type variation can be measured both at the chain level and at the store level. At the chain level, the degree of market-type *dispersion* is the amount of variation in location characteristics among stores within a chain. For example, a chain with all of its stores in Santa Monica, CA has a lower level of market-type dispersion than a chain with stores in downtown L.A., Santa Monica, and Sherman Oaks. At the store level, the degree of market-type *divergence* is the extent to which a store's location demographic characteristics differ from the average demographic characteristics in a chain. For example, if a chain has one store in Harvard Square and the rest of its stores in Roxbury, then the store in Harvard Square has higher market-type divergence than the stores in Roxbury. In the following subsections we describe alternative measures of chain-level market-type dispersion and store-level market-type divergence.

Measurement of Chain-Level Market-Type Dispersion

The construction of market-type dispersion is particularly important because this measure has not been studied in previous literature. Earlier we defined market-type dispersion as the variation of certain location characteristics among stores within a chain. To construct a measure for market-type dispersion, we first identify the location characteristics that are most likely to affect the store's demand conditions. We then discuss four ways to measure dispersion and compare the regression results obtained with the different measures.

The marketing literature has identified population density, household size, per capita income, age, and ethnicity as among the most relevant drivers of customer demand in chain organizations (Gupta and Chintagunta 1994; Hoch et al. 1995; Kalyanam and Putler 1997; Mulhern et al. 1998). Examples from research along these five dimensions can be found in Appendix A. All of these location characteristics are available from the ESRI data set

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[10] TDLinx is a division of A.C. Nielsen (U.S.), Inc. Its TD Channel Database covers the population of chain stores in the United States for several service and retail industries, one of which is convenience store chains. TDLinx data on ownership structure is collected to provide standardized information to consumer goods manufacturers (Coke, Pepsi, Kraft, etc.) about their retail clients. The TDLinx database has nearly universal coverage of all convenience stores operating in the U.S., though some very small businesses such as newsstands in airports may not be covered. TDLinx collects information from a variety of different sources including direct relationships with retailers, public sources, and direct research by the organization (telephone surveys, Internet searches, etc.). Based on these data, TDLinx keeps records identifying the corporate owner as well as the franchisee owner (if any) of each store.

(containing data from the 2000 U.S. Census) at the zip code level. We use the U.S. Census definition of per capita income (in dollar terms) and average household size (in terms of number of persons), and compute population density as the number of inhabitants per square mile. For ethnicity, we calculate the percentage of white population. We utilize the median age of the population to calculate age.

Below we discuss different ways of constructing dispersion measures along the five location characteristics described above. One set of measures is based on the variation of individual location characteristics, while a second set of measures is defined utilizing cluster analysis.

Market-Type Dispersion Based on Variation of Location Characteristics

One way to measure dispersion is to obtain the standard deviation of each location characteristic L across the stores in a given chain i. However, a disadvantage of the standard deviation measure is that it is measured in the same units as the location characteristic L (e.g., the standard deviation of per capita income is measured in dollars), and thus it cannot be compared to other location characteristics. To address this issue, we calculate the dispersion of each location characteristic L by normalizing the standard deviation by the average value of the location characteristic across all stores within the chain i:

$$Normalized\ Dispersion_{Li} = \frac{\text{Std. Deviation}_{Li}}{\text{Mean}_{Li}}. \tag{1}$$

The *Normalized Dispersion* measure has no units and thus can be compared along different location characteristics. This measure gives a sense of the amount of variation among stores in a chain for a particular location characteristic, in proportion to the typical value of that location characteristic within the chain. To construct the chain's overall market-type dispersion we aggregate the *Normalized Dispersion* measures of each chain i either through addition or multiplication:

$$MDISPERSION\_SUM_i = \sum_{L=1}^{5} Normalized\ Dispersion_{Li}; \tag{2}$$

$$MDISPERSION\_MULT_i = \prod_{L=1}^{5} Normalized\ Dispersion_{Li}. \tag{3}$$

The added dispersion measure would assign equal weights to the five location characteristics and treat them independently. The multiplied aggregated dispersion differs from the added aggregated dispersion because it contains interaction effects. Thus, *MDISPERSION_MULT* is more sensitive to extremely high- or low-dispersion values on any single location characteristic. For example, this term would place more (less) weight on the average household measure when income dispersion or some other location characteristic is also high (low).

Market-Type Dispersion Based on Cluster Analysis

A different approach to measuring market-type dispersion is to segment the markets using cluster analysis and then to observe the number of clusters (or "market types") served by each of the chain stores. In line with the clustering approach of most segmentation studies in marketing research (Chaturvedi et al. 1997; Punj and Stewart 1983), we cluster the 29,827 zip codes in the ESRI database into groups with similar location characteristics (i.e., population density, average household size, per capita income, ethnicity, and age). Our clustering procedure (described in Appendix B) yields 25 groups of zip codes with an R^2 of 81.1 percent,[11] and R^2s that range between 77 (for the average household size) and 85 percent (for the degree of ethnicity) for the five location characteristics, suggesting our cluster solution has a reasonable level of homogeneity within groups and the clusters are well separated based on all the location variables. Using the 25 zip code clusters (or "types of markets"), we construct an additional market-type dispersion measure based on a Herfindahl index defined as:

$$MDISPERSION\_HHI_i = \left[1 - \sum_{X=1}^{25}\left(\frac{\text{number of stores in cluster } X \text{ in chain } i}{\text{total number of stores in chain } i}\right)^2\right] \times 100, \tag{4}$$

with a minimum value of 0 if all stores in a chain are located in a single type of market, and a maximum value of 96 if a chain has exactly 1/25th of its stores in each of the clusters.

The market dispersion measure based on clusters differs from the dispersion measures obtained from the variation of each of the location characteristics. First, *MDISPERSION_HHI* is less sensitive to outliers in location characteristics. For instance, having a store location with average per capita income much higher than the rest of the chain would influence *MDISPERSION_SUM* and *MDISPERSION_MULT* by significantly increasing the standard deviation of per capita income within the chain, but would have little effect on the Herfindahl calculation of market-type dispersion. This is because the Herfindahl measure only captures the extent to which a chain's stores are dispersed across different clusters but does not account for the degree of differences in location characteristics across those clusters. Second, *MDISPERSION_HHI* loses information on how stores are distributed within each cluster. Finally, *MDISPERSION_HHI* does not discriminate among which clusters the stores fall under. For instance, if there are two chains, A and B, where chain A has half of its stores in Cluster 1 and half of its stores in Cluster 2, while chain B has half of its stores in Cluster 1 and half of its stores in Cluster 3, then both chains would have the same *MDISPERSION_HHI* values. However, if the difference between the location characteristics of Clusters 1 and 2 is greater than the difference in location characteristics in Clusters 1 and 3, then under *MDISPERSION_SUM* and *MDISPERSION_MULT*, chain A would be more dispersed than chain B.

Measurement of Store-Level Market-Type Divergence

As defined earlier, market-type divergence at the store level is the extent to which the store's location characteristics differ from the average location characteristics in the chain. To differentiate these measures from those at the chain level, we refer to store-level dispersion measures as "market divergence" measures. As in the case of the chain-level dispersion measures, we use population density, average household size, per capita income, ethnicity, and age as the relevant location characteristics. We construct two sets of market divergence measures; the first is based on the divergence between the store's location characteristics and the chain's average characteristics, and the second is defined in terms of the clusters in each chain.

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[11] The R^2 is the ratio between (the standard deviation between groups) and (the sum of the standard deviation between groups and the standard deviation within groups).

Market-Type Divergence Based on Individual Location Characteristics

To calculate market divergence at the store level, we calculate the absolute value of the difference between the value of a location characteristic L for store j and the average value of location characteristic L across all stores in chain i, that is $|L_{ij} - \overline{L}_i|$. This measure has different units for different location characteristics (e.g., per capita income divergence is measured in dollar terms, while average household size is measured in number of persons). To make the measures of different location characteristics comparable, we normalize this divergence measure by the standard deviation of the L values for all stores in chain i. Thus, we define for each location characteristic L:

$$Normalized\ Divergence_{Lij} = \frac{|L_{ij} - \overline{L}_i|}{\text{Std. Deviation}_{Li}}. \tag{5}$$

This measure indicates how many standard deviations store j's location characteristic L is from chain i's average. We aggregate the *Normalized Divergence* metrics either by multiplying or adding the *Normalized Divergence* measure across the five different location characteristics:

$$MDIVERGENCE\_SUM_{ij} = \sum_{L=1}^{5} Normalized\ Divergence_{Lij} \tag{6}$$

$$MDIVERGENCE\_MULT_{ij} = \prod_{L=1}^{5} Normalized\ Divergence_{Lij}. \tag{7}$$

As in the case of the chain-level dispersion measures, the aggregated divergence metric constructed via addition treats the five market characteristic dimensions as independent of one another, whereas the aggregated divergence measure constructed via multiplication contains interaction effects for the different location characteristics.

Market-Type Divergence Based on Cluster Analysis

Using the 25 market clusters identified at the chain level, we construct a measure of store-level divergence that captures the divergence between the store's cluster and the most frequent cluster in the chain, weighted by the frequency of the main cluster:

$$MDIVERGENCE\_mainclust_{ij} = \%mainclust_i * distance_{ij} \tag{8}$$

where:

%mainclust = percentage of stores in the most frequent cluster in chain i; and
distance = distance between the centroids of store j's cluster and the chain's most frequent cluster, calculated as $\sum_{L=1}^{5} |\overline{L}_{cj} - \overline{L}_{cm}|$, where $\overline{L}_{cj}$ is the average value of location characteristic L in store j's cluster, while $\overline{L}_{cm}$ is the average value of location characteristic L in the chain's most frequent cluster.[12]

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[12] Whenever the chain had more than one "most frequent" cluster, the distance is calculated relative to the closest "most frequent" cluster.

To summarize, the two methods for calculating dispersion at the chain level and divergence at the store level are: (1) measures based on the variation in individual location characteristics that lead to the *MDISPERSION_SUM* and *MDISPERSION_MULT* measures at the chain level and the *MDIVERGENCE_SUM* and *MDIVERGENCE_MULT* measures at the store level; and (2) measures based on 25 different clusters (types of markets), which include *MDISPERSION_HHI* at the chain level and *MDIVERGENCE_mainclust* at the store level.

V. RESEARCH METHODOLOGY AND EMPIRICAL RESULTS

Chain-Level Methodology

To test H1—i.e., whether a positive association exists between a chain's decision to franchise its stores and market-type dispersion—we perform multivariate tests, where the dependent variable captures the chain's decision to franchise none, some, or all of its stores and the main explanatory variable consists of the chain's market-type dispersion (*MDISPERSION,* measured as *MDISPERSION_SUM, MDISPERSION_MULT,* or *MDISPERSION_HHI* as described in Section IV). A general specification of the model is described as follows:

$$FRANCHISING_i = f\,(MDISPERSION_i,\ CHAIN\_STATEHHI_i,\ CHAIN\_NSTORES_i,\ SALES\_PER\_STORE_i,\ SQFT\_PER\_STORE_i). \qquad (9)$$

Our multivariate approach consists of estimating an Ordinal Logit Model where the franchising variable is a categorical variable equal to 0 if the chain owns all of its stores, 1 if it franchises some but not all of its stores, and 2 if it franchises all of its stores. We include four control variables identified by the previous literature as determinants of a chain's decision to franchise its stores. The first measure, *CHAIN_STATEHHI* is defined as:

$$\left[1 - \sum_{X=1}^{50} \left(\frac{\text{number of stores in state } X \text{ in chain } i}{\text{total number of stores in chain } i}\right)^2\right] \times 100. \qquad (10)$$

This measure varies between 0 (if all stores in a chain are located in one state) and 98 (if a chain has 1/50th of its stores in each of the 50 states). Monitoring costs (and thus the propensity to franchise) tend to be higher if stores are spread across multiple locations and if stores are isolated rather than surrounded by other stores from the same chain (Brickley and Dark 1987; Brickley et al. 1991). *CHAIN_STATEHHI* captures both of these dimensions as it measures the extent to which a chain's stores are dispersed across multiple states.[13] Consequently, we expect that *CHAIN_STATEHHI* will be positively related to franchising. The second control, *CHAIN_NSTORES*, is the number of stores in the chain. We make no prediction on this variable. On the one hand, franchising and the chain's number of stores are endogenously determined since chains that franchise more might be able to grow larger, leading to a positive relation between both measures. On the other hand, this measure captures the level of firm maturity and should indicate a smaller need for franchising as a means to raise capital (Carney and Gedajlovic 1991). Such interpretation would lead us to expect a negative relation to franchising. We note, however, that previous research suggests that the primary use of franchising is *not* to raise capital.[14] Finally, we include two measures of the average size of outlets operated by each chain. *SALES_PER_STORE* and *SQFT_PER_STORE* measure outlet size as the chain's average sales per store ($000s) and average square feet per store (000s), respectively. Theoretically, when an outlet is large, the manager has more responsibility and her inputs are more important, leading to more incentives and delegation via franchising. However, despite this theoretical prediction, with very few exceptions, prior research consistently finds measures of outlet size (e.g., store sales) to be negatively related to the likelihood of franchising (see Lafontaine and Slade [1997] for an overview of such studies). Thus, we make no prediction on outlet size measures in our analysis.

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[13] Measuring geographic dispersion of a chain at the state level is consistent with previous research on chain-level franchising decisions (Scott 1995). All of our results are robust to measuring geographic dispersion using more granular geographic areas such as counties or zip codes.

Store-Level Methodology

Conditional on a chain's decision to own some of its stores and franchise others, we examine whether a positive association exists between franchising and market-type dispersion at a store level (i.e., H2). We run the following logit regression model on the subsample of stores *j* belonging to chains *i* that franchise some, but not all, of their stores:

$$\begin{aligned} Pr\ (FRANCHISE_{ij}) = f\ (&MDIVERGENCE_{ij},\ DISTANCE\ HQ_{ij},\\ &NSTORES\_ZIPCHAIN_{ij},\ SALES_{ij},\ SQFT_{ij},\\ &OTHER\_FRANCHISED_{ij},\ CHAIN\ FIXED\ EFFECTS_{ij}). \quad (11) \end{aligned}$$

The dependent variable of this model is a dummy equal to 1 if the store is a franchisee, and 0 otherwise. The main explanatory variable is the *MDIVERGENCE* measure, which can be measured using any of the store-level market divergence measures: *MDIVERGENCE_SUM, MDIVERGENCE_MULT,* and *MDIVERGENCE_mainclust* (see Section IV). We expect these measures to be positively related to the store's likelihood of being franchised.

We control for geographic dispersion using two control measures: *DISTANCE_HQ*, which is the distance in miles between the store's zip code and the headquarters' zip code, and *NSTORES_ZIPCHAIN*, which is the number of same chain stores within the store's zip code. The former measure is expected to be positively related, and the latter negatively related, to the store's likelihood of being franchised. Consistent with prior literature, we control for outlet size using two measures, *SALES* and *SQFT,* which measure outlet size as the sales ($000s) and square feet (000s) of each store, respectively. To control for the possibility that higher demand for franchising in a zip code leads to more franchising activity, we also include the number of other-chain outlets operated via franchising (*OTHER_FRANCHISED*) in our specification.

Finally, we control for chain fixed effects. By doing so, we mitigate omitted variables concerns at the chain level, such as the chain's need to raise money or its brand value

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[14] The explanation that franchising is used primarily to raise capital is inconsistent with several empirical findings. First, Rubin (1978) argues that if the headquarters' only motives for franchising were to raise capital with no consideration to incentives, the franchisees' resources would not be invested in the individual stores but rather in a portfolio of all stores to diversify investment risks and lower the costs of raising capital. Second, empirical research has found that franchisors that grow larger finance their own franchisees instead of raising money through franchising (Shane et al. 2006). Third, if the purpose of franchising were to raise capital, then young firms would franchise while they have capital constraints but revert to company-owned stores once they grow and have access to capital. However, empirical research does not find this (Caves and Murphy 1976; Lafontaine and Shaw 2005; Martin 1988).

(Brickley and Dark 1987; Lafontaine 1992).[15] Conditional on the firm's expansion strategy (e.g., mix of franchise and company-owned outlets, or operations across broad versus narrow geographic areas), these analyses examine whether firms are *systematically* choosing which stores to franchise and which to own and how this choice depends on the degree to which characteristics of the store's market diverge from those of the chain's predominant types of markets.[16]

Summary Statistics

Summary statistics for our sample of 420 chains with at least 20 stores are provided in Table 1. Convenience store chains in our sample vary widely on all measures of market dispersion. Chains compete in 11 different "market-types"[17] on average and range from competing in only one market type (*MDISPERSION_HHI* = 0) to competing across all 25 market types identified in our cluster analysis of zip-code demographics. Stores in the most dispersed chain are distributed almost evenly across all market types (*MDISPERSION_HHI* = 94.2). Chains in our sample also show considerable variation in geographic dispersion ranging from concentrating all stores within a single state (*CHAIN_STATEHHI* = 0) to coming close to equally dispersing stores across all 50 states (*CHAIN_STATEHHI* = 96.4). The average chain in our sample has 152 stores.

Only 14 percent of chains in our sample operate any of their stores as franchises. However, the total number of stores operated by this subset of chains represents 61 percent of the stores operated by all chains in our sample.[18] Further information on the distribution of franchise activity in our sample is provided in Panel A of Table 2, which shows that 10.2 percent of sample chains organize by franchising some but not all stores, while 3.3 percent operate all stores as franchises. Chains that do franchise some but not all stores vary widely in their franchising decisions, operating approximately 53 percent of their stores as franchises on average, with the proportion of stores franchised ranging from 0.2 to 99.6 percent. Panel B of Table 2 shows that, on average, those chains that franchise at least some of their stores face considerably more geographic and market-type dispersion than chains that do not franchise at all. Chains that franchise some, but not all of their

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[15] For our store-level analyses, we estimate logits with chain indicators. It is well known that coefficient estimates from logit models that include dummy variables to estimate fixed effects are biased (Maddala 1987). However, holding the number of cross-sectional groups constant, the coefficient bias in these models tends to 0 as the number of within-group observations increases (Wooldridge 2002). For our store-level analyses, we have 43 chains with an average of 811 stores per chain. Only 4 of these chains operate less than 50 stores. Thus, our data set is characterized by a small number of groups, each with a large number of within-group observations and is ideally suited for estimation by logit with group (e.g., chain) dummies. We also tested the robustness of our results to the fixed-effects logit model of Chamberlain (1980). However, this model is computationally difficult for data sets with very large numbers of within-group observations (Baltagi 1995; Greene 1993). We were not able to get this model to converge when including the largest chains in our sample (i.e., chains with more than 1,000 stores). We estimated the Chamberlain fixed-effects logit model on the sample of chains with less than 1,000 stores each and found substantively similar results to those reported in Table 7. For the sample of chains with over 1,000 stores each, we estimated a logit specification with chain indicators and, again, found similar results. This latter sample is unlikely to suffer from biased coefficient estimates as it consists of only 10 chains with an average of 2,594 stores per chain.

[16] We also re-ran all analyses using the levels of the individual characteristics underlying our market-type divergence measures as additional controls. As expected, we find that ethnicity, household size, income, and age are unrelated to the likelihood of franchising. We also did not find evidence of a relation between franchising and population density, which has been used in the prior literature as a proxy for monitoring costs. This is likely to be explained by the fact that we already control for "chain-specific" measures of geographic access and economies of scale in monitoring (e.g., distance from headquarters and geographic concentration of stores). All of our market-type dispersion results are robust to including these variables as additional controls.

[17] The number of market-types is not tabulated.

[18] The 420 chains in our sample collectively operate 63,933 stores. Chains that franchise at least some of their stores collectively operate 38,991 stores.

TABLE 1
Summary Statistics for the Chain-Level Dataset
(n = 420 Chains)

Variable	Mean	Std. Dev.	Minimum	Maximum
Market Dispersion Measures				
MDISPERSION_SUM	1.97	0.58	0.56	5.16
MDISPERSION_MULT	0.001	0.002	0.000002	0.01
MDISPERSION_HHI	79.2	12.1	0	94.2
Geographic Dispersion Measures				
CHAIN_STATEHHI	26.7	30.5	0	96.4
Chain Characteristics				
CHAIN_NSTORES	152	463.5	20	5758
SALES_PER_STORE	45.8	23.2	8.6	309.1
SQFT_PER_STORE	2.3	1.1	1.0	16.7
CHAIN_FRANCHISOR	0.14	0.34	0	1

Data Sources: TDLinx 2004 Channel Database; 2004 ESRI Business Location File.

Variable Definitions:

MDISPERSION_SUM = market-type dispersion measured as the aggregate sum of individual *Normalized Dispersion* measures based on location characteristics (population, income, age, ethnicity, household size);

MDISPERSION_MULT = market-type dispersion measured as the aggregate product of individual *Normalized Dispersion* measures based on location characteristics (population, income, age, ethnicity, household size);

$$MDISPERSION\_HHI = \left[1 - \sum_{X=1}^{25}\left(\frac{\text{number of stores in cluster } X \text{ in chain } i}{\text{total number of stores in chain } i}\right)^2\right] \times 100;$$

$$CHAIN\_STATEHHI = \left[1 - \sum_{X=1}^{50}\left(\frac{\text{number of stores in state } X \text{ in chain } i}{\text{total number of stores in chain } i}\right)^2\right] \times 100;$$

CHAIN_NSTORES = total number of stores operated by the chain;

SALES_PER_STORE, SQFT_PER_STORE = average weekly sales ($000s) and total square feet (000s) per store operated by the chain, respectively; and

CHAIN_FRANCHISOR = indicator for whether a chain franchises any of its stores.

stores are also the largest as measured by the number of stores. Table 3 demonstrates that our measures of chain-level market-type dispersion show only small to moderate correlations with measures of geographic dispersion.

Summary statistics for the sample of 34,892 stores belonging to the 43 chains that franchise some but not all of their stores are provided in Table 4, which shows that 69 percent of such stores are franchised. Stores in the sample vary widely on all measures of market-type divergence. Not surprisingly, there is also wide variation across all the demographic characteristics used to construct the market-type divergence measures. The average store is 658 miles away from chain headquarters and operates in a zip code with two stores from the same chain. Table 5 demonstrates that our measures of store-level market-type divergence show only small correlations with measures of geographic dispersion.

Chain-Level Empirical Results

The ordinal-logit specifications in Panel A of Table 6 demonstrate results on the association between the likelihood of franchising and geographic dispersion that are consistent with prior literature on the determinants of franchising. Consistent with higher monitoring costs associated with geographic dispersion of business units (Brickley and Dark 1987;

TABLE 2
Descriptive Statistics of Chains Categorized by Level of Franchising Activity

Panel A: Distribution of Franchise Activity across Chains

	Number of Chains	% Sample	Mean % of Stores Franchised	Minimum % of Stores Franchised	Maximum % of Stores Franchised
No Franchised Stores	363	86.4	0	0	0
Some Franchised Stores*	43	10.2	52.5	0.2	99.6
All Franchised Stores	14	3.3	100	100	100

Panel B: Mean Values of Chain-Level Variables by Level of Franchising Activity

Variable	No Franchised Stores	Some Franchised Stores	All Franchised Stores
Market Dispersion Measures			
MDISPERSION_SUM	1.91	2.31	2.26
MDISPERSION_MULT	0.001	0.003	0.002
MDISPERSION_HHI	77.72	88.95	88.57
Geographic Dispersion Measures			
CHAIN_STATEHHI	21.62	60.40	54.21
Chain Characteristics			
CHAIN_NSTORES	68.71	811.44	292.79
SALES_PER_STORE	45.97	47.04	37.37
SQFT_PER_STORE	2.32	2.05	1.96

* Some Franchised Stores = 0 < percent of Chain's Stores Franchised < 1.

Data Sources: TDLinx 2004 Channel Database; 2004 ESRI Business Location File.

Variable Definitions:

MDISPERSION_SUM = market-type dispersion measured as the aggregate sum of individual *Normalized Dispersion* measures based on location characteristics (population, income, age, ethnicity, household size);

MDISPERSION_MULT = market-type dispersion measured as the aggregate product of individual *Normalized Dispersion* measures based on location characteristics (population, income, age, ethnicity, household size);

MDISPERSION_HHI = $\left[1 - \sum_{X=1}^{25}\left(\frac{\text{number of stores in cluster } X \text{ in chain } i}{\text{total number of stores in chain } i}\right)^2\right] \times 100;$

CHAIN_STATEHHI = $\left[1 - \sum_{X=1}^{50}\left(\frac{\text{number of stores in state } X \text{ in chain } i}{\text{total number of stores in chain } i}\right)^2\right] \times 100;$

CHAIN_NSTORES = total number of stores operated by the chain; and

SALES_PER_STORE, SQFT_PER_STORE = average weekly sales ($000s) and total square feet (000's) per store operated by the chain, respectively.

Scott 1995), chains that are more geographically disperse (*CHAIN_STATEHHI*) and larger chains (log of *CHAIN_NSTORES*) are more likely to franchise some or all of their stores ($p < 0.05$ in most specifications). Similarly, consistent with prior literature (Lafontaine and Slade 1997), chains that operate larger outlets (*SALES_PER_STORE, SQFT_PER_STORE*) have a smaller propensity to franchise. The results in Panel A of Table 6 provide strong evidence in support of H1. When measured by *MDISPERSION_SUM*, *MDISPERSION_MULT*, or *MDISPERSION_HHI*, market dispersion is positively and significantly related to the likelihood of franchising ($p < 0.10$ in all specifications). The results are substantively

TABLE 3
Chain-Level Correlations between Measures of Geographic and Market-Type Dispersion (n = 420 Chains)

	CHAIN_STATEHHI	*MDISPERSION_SUM*	*MDISPERSION_MULT*
CHAIN_STATEHHI	1		
MDISPERSION_SUM	0.3161*	1	
MDISPERSION_MULT	0.2757*	0.4129*	1
MDISPERSION_HHI	0.3210*	0.2792*	0.3280*

* Significant ($p < 0.10$).

Data Sources: TDLinx 2004 Channel Database; 2004 ESRI Business Location File.

Variable Definitions:

$$CHAIN\_STATEHHI = \left[1 - \sum_{X=1}^{50}\left(\frac{\text{number of stores in state } X \text{ in chain } i}{\text{total number of stores in chain } i}\right)^2\right] \times 100;$$

MDISPERSION_SUM = market-type dispersion measured as the aggregate sum of individual *Normalized Dispersion* measures based on location characteristics (population, income, age, ethnicity, household size);

MDISPERSION_MULT = market-type dispersion measured as the aggregate product of individual *Normalized Dispersion* measures based on location characteristics (population, income, age, ethnicity, household size); and

$$MDISPERSION\_HHI = \left[1 - \sum_{X=1}^{25}\left(\frac{\text{number of stores in cluster } X \text{ in chain } i}{\text{total number of stores in chain } i}\right)^2\right] \times 100.$$

similar in Panel B of Table 6, where Tobit regression is used to model the percentage of stores franchised rather than the decision to franchise none, some, or all stores (in an ordered-logit regression).[19]

To gauge the economic significance of these results, the coefficient estimates from our ordered-logit specifications suggest that, holding chain size, average outlet size, and geographic dispersion constant at their mean values, a chain with the mean level of market dispersion measured as *MDISPERSION_HHI* has a 96.2, 3.3, and 0.5 percent probability of franchising no, some, or all stores, respectively. By contrast, holding all other variables at their mean values, a chain for which *MDISPERSION_HHI* is one standard deviation above the mean has a 74.3, 21.5, and 4.2 percent probability of franchising no, some, or all stores, respectively. Overall, these results support the hypothesis that, after controlling for geographic dispersion and other determinants, chains are more likely to use franchising when operating across diverse market types (H1).

Store-Level Empirical Results

The logit specifications in Table 7 demonstrate results on the association between the likelihood of franchising a given store and measures of geographic distance, geographic concentration, and outlet size that are consistent with prior literature (e.g., Brickley and Dark 1987; Lafontaine and Slade 1997). Geographic distance from headquarters (log of *DISTANCE_HQ*) is positively and significantly ($p < 0.001$) related to the probability of franchising a store while the number of stores in the same zip code operated by the chain with which the store is affiliated (*NSTORES_ZIPCHAIN*) is negatively and significantly ($p < 0.05$) related to the probability of franchising a store in all specifications. Outlet size

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[19] Results are also substantively similar when the percentage of sales from franchised units within the chain is used as the dependent variable rather than the percentage of stores that are franchised within the chain.

TABLE 4
Summary Statistics for the Store-Level Dataset
(n = 34,892 Stores across 43 Chains)

Variable	Mean	Std. Dev.	Minimum	Maximum
Franchise Choice				
FRANCHISE	0.69	0.46	0.00	1.00
Market Divergence Measures				
MDIVERGENCE_SUM	3.6	2.0	0.3	25.4
MDIVERGENCE_MULT	0.87	7.4	3.81×10^{-8}	548.6
MDIVERGENCE_MAINCLUST	48.3	32.0	0.0	323.5
Geographic Divergence Measures				
DISTANCE_HQ	658	624	0	4,701
NSTORES_ZIPCHAIN	2.0	1.8	1.0	23.0
Store Size Measures				
SALES	46.3	22.1	7	175
SQFT	1.97	0.71	1	21
Zip Code Characteristics				
OTHER_FRANCHISED	0.51	1.17	0	17
% White Population	73.9	21.8	0.5	100
Average Household Size	2.6	0.4	1.3	5.4
Median Income	52,954	18,573	10,830	192,006
Median Age	36.4	5.4	19.1	74.8
Population per Square Mile	2,700	4,065	0.003	96,990

Data Source: TDLinx 2004 Channel Database; 2004 ESRI Business Location File.

Variable Definitions:

FRANCHISE = indicator for whether store is franchised;
MDIVERGENCE_SUM = market-type divergence measured as the sum of the absolute values of normalized differences on each location characteristic between the store and the average value of the location characteristic for the chain;
MDISPERSION_MULT = market-type divergence measured as the product of the absolute values of normalized differences on each location characteristic between the store and the average value of the location characteristic for the chain;
MDISPERSION_MAINCLUST = cluster distance between the store's cluster and the most frequent cluster in the chain, weighted by the proportion of the chain's stores in the main cluster;
DISTANCE_HQ = distance in miles from chain headquarters to store;
NSTORES_ZIPCHAIN = number of same-chain stores in the zip code (stores that are operated by the same chain with which the store is affiliated);
SALES, SQFT = average weekly sales ($000s) and total square feet (000s) per store operated by the chain, respectively; and
OTHER_FRANCHISED = number of other chain stores that are franchised in the zip code.

(*SALES*, *SQFT*) is negatively and significantly related to the probability of franchising a store. The number of other-chain outlets operated via franchising (*OTHER_FRANCHISED*) is positively and significantly related to the probability of a store being franchised. This finding is not only consistent with a higher demand for franchising in a zip code leading to more franchising activity, but is also consistent with other explanations such as higher competition leading to more delegation and higher-powered incentives via franchising.

The results in Table 7 provide strong evidence in support of H2. As predicted, when measured by *MDIVERGENCE_SUM*, *MDIVERGENCE_MULT*, or *MDIVERGENCE_MAINCLUST*, market-type divergence is positively and significantly related to the likelihood of franchising after controlling for other determinants ($p < 0.01$ for all measures).

TABLE 5
Store-Level Correlations between Measures of Geographic and Market-Type Divergence
(n = 34,892 Stores across 43 Chains)

	DISTANCE_HQ	*NSTORES_ZIPCHAIN*	*MDIVERGENCE_SUM*	*MDIVERGENCE_MULT*	*MDIVERGENCE_MAINCLUST*
DISTANCE_HQ	1				
NSTORES_ZIPCHAIN	0.1297*	1			
MDIVERGENCE_SUM	0.0924*	−0.0574*	1		
MDIVERGENCE_MULT	0.0218*	−0.0241*	0.4441*	1	
MDIVERGENCE_MAINCLUST	−0.1714*	0.1034*	0.6370*	0.2277*	1

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* Significant ($p < 0.10$).

Data Sources: TDLinx 2004 Channel Database; 2004 ESRI Business Location File.

Variable Definitions:

DISTANCE_HQ = distance in miles from chain headquarters to store;

NSTORES_ZIPCHAIN = number of same-chain stores in the zip code (stores that are operated by the same chain with which the store is affiliated);

MDIVERGENCE_SUM = market-type divergence measured as the sum of the absolute values of normalized differences on each location characteristic between the store and the average value of the location characteristic for the chain;

MDISPERSION_MULT = market-type divergence measured as the product of the absolute values of normalized differences on each location characteristic between the store and the average value of the location characteristic for the chain; and

MDISPERSION_MAINCLUST = cluster distance between the store's cluster and the most frequent cluster in the chain, weighted by the proportion of the chain's stores in the main cluster.

TABLE 6
Relationship Between Franchising and Market-Type Dispersion in Chains

Panel A: Ordinal Logit Regressions Linking the Likelihood of Franchising No, Some, or All Stores to Measures of Market Dispersion, Geographic Dispersion, and Chain Size (n = 420 Chains)[a]

		Ordinal Logits			
	Predicted	**Model 1**	**Model 2**	**Model 3**	**Model 4**
CHAIN_STATEHHI	+	0.017	0.015	0.017	0.010
p-value		0.022	0.042	0.018	0.139
Log(CHAIN_NSTORES)	?	0.797	0.787	0.666	0.455
p-value		0.000	0.000	0.000	0.005
SALES_PER_STORE	?	−0.012	−0.011	−0.018	−0.020
p-value		0.172	0.204	0.065	0.041
SQFT_PER_STORE	?	−0.969	−0.946	−0.671	−0.582
p-value		0.084	0.088	0.094	0.098
MDISPERSION_SUM	+		0.304		
p-value			0.091		
MDISPERSION_MULT	+			313.614	
p-value				0.000	
MDISPERSION_HHI	+				0.187
p-value					0.000
R^2		26%	27%	30%	32%
n		420	420	420	420

Panel B: Tobit Regressions Linking the Percentage of Units Franchised to Measures of Market Dispersion, Geographic Dispersion, and Chain Size (n = 420 Chains)[b]

		Tobits			
	Predicted	**Model 1**	**Model 2**	**Model 3**	**Model 4**
CHAIN_STATEHHI	+	0.006	0.005	0.006	0.003
p-value		0.020	0.048	0.015	0.083
Log(CHAIN_NSTORES)	?	0.391	0.384	0.310	0.247
p-value		0.000	0.000	0.000	0.000
SALES_PER_STORE	?	−0.008	−0.007	−0.010	−0.010
p-value		0.042	0.054	0.008	0.009
SQFT_PER_STORE	?	−0.426	−0.408	−0.263	−0.309
p-value		0.005	0.007	0.068	0.040
MDISPERSION_SUM	+		0.125		
p-value			0.098		
MDISPERSION_MULT	+			139.445	
p-value				0.000	
MDISPERSION_HHI	+				0.061
p-value					0.000
R^2		31%	32%	36%	37%
n		420	420	420	420

(*continued on next page*)

TABLE 6 (continued)

Data Sources: TDLinx 2004 Channel Database; 2004 ESRI Business Location File.

[a] Dependent variable in all specifications = 1 if chain does not franchise any stores, 2 if chain franchises some but not all stores, and 3 if chain franchises all stores.

[b] Dependent variable in all specifications = percentage of stores franchised.

Variable Definitions:

CHAIN_STATEHHI = $\left[1 - \sum_{X=1}^{50} \left(\frac{\text{number of stores in state } X \text{ in chain } i}{\text{total number of stores in chain } i}\right)^2\right] \times 100$;

CHAIN_NSTORES = total number of stores operated by the chain;

SALES_PER_STORE, SQFT_PER_STORE = average weekly sales ($000s) and total square feet (000s) per store operated by the chain, respectively;

MDISPERSION_SUM = market-type dispersion measured as the aggregate sum of individual *Normalized Dispersion* measures based on location characteristics (population, income, age, ethnicity, household size);

MDISPERSION_MULT = market-type dispersion measured as the aggregate product of individual *Normalized Dispersion* measures based on location characteristics (population, income, age, ethnicity, household size); and

MDISPERSION_HHI = $\left[1 - \sum_{X=1}^{25} \left(\frac{\text{number of stores in cluster } X \text{ in chain } i}{\text{total number of stores in chain } i}\right)^2\right] \times 100$.

To gauge the economic significance of these results, our coefficient estimates suggest that, holding distance to headquarters, number of same-chain stores in the zip code, outlet size, and number of other-chain franchised outlets at their mean values, the probability of a store with the mean level of market-type divergence being franchised is approximately 73 percent, regardless of the measure of market-type divergence used. By contrast, holding all other variables at their mean values, the probability of the most divergent store in a chain being franchised is 79, 85, or 75 percent on average when market-type divergence is measured by *MDIVERGENCE_SUM*, *MDIVERGENCE_MULT*, or *MDIVERGENCE_MAINCLUST*, respectively. Overall, these results indicate that after controlling for geographic dispersion, chains are more likely to franchise individual stores located in markets with characteristics that diverge most significantly from the predominant characteristics of markets in which the chain operates (H2).

These findings provide evidence of firms making systematic choices about organizational design at *the individual business unit level.* In contrast to prior research in the accounting literature that has tested theories of business-unit organizational design choices using data collected only at the organizational level (Bushman et al. 1995; Nagar 2002) or based on cross-sectional differences in individual business units across organizations (Abernethy et al. 2004; Widener et al. 2008), our findings reveal within-firm variation in organizational design choices in response to the local operating environment of individual business units.

Market-Type Dispersion as a Determinant and Outcome of Organizational Design Choices

Our chain- and store-level results so far provide strong evidence of deliberate organizational design choices made by firms to manage the complexity of operating in a variety of different market types. However, the possibility remains that the franchising choice and the choice of expanding into divergent markets are made simultaneously. The willingness to use franchising as an organizational design mechanism may facilitate a firm's ability to

TABLE 7
Logit Regressions Linking the Probability of Franchising an Individual Store to Measures of Market Divergence and Geographic Concentration
(n = 34,892 Stores across 43 Chains)

		Logits		
	Predicted	**Model 1**	**Model 2**	**Model 3**
Constant	?	2.539	2.703	2.700
p-value		0.000	0.000	0.000
Log(DISTANCE_HQ)	+	0.225	0.222	0.222
p-value		0.000	0.000	0.000
NSTORES_ZIPCHAIN	−	−0.023	−0.025	−0.027
p-value		0.038	0.026	0.018
SALES	?	−0.043	−0.043	−0.043
p-value		0.000	0.000	0.000
SQFT	?	−0.401	−0.401	−0.399
p-value		0.000	0.000	0.000
OTHER_FRANCHISED	?	0.045	0.042	0.042
p-value		0.003	0.006	0.006
MDIVERGENCE_SUM	+	0.045		
p-value		0.000		
MDIVERGENCE_MULT	+		0.010	
p-value			0.000	
MDIVERGENCE_MAINCLUST	+			0.006
p-value				0.008
Chain Indicators		Yes	Yes	Yes
R^2		43%	43%	43%
n		34,892	34,892	34,892

Dependent variable in all specifications = 1 store is franchised, and 0 if store is company owned.

Chain indicators are jointly significant ($p < 0.001$).

Data Sources: TDLinx 2004 Channel Database; 2004 ESRI Business Location File.

Variable Definitions:

DISTANCE_HQ = natural logarithm of distance in miles from chain headquarters to store;
NSTORES_ZIPCHAIN = number of same-chain stores in the zip code (stores that are operated by the same chain with which the store is affiliated);
SALES, SQFT = store size measured by average weekly sales ($000s) and square feet (000s), respectively;
OTHER_FRANCHISED = number of other-chain outlets in zip code operated through franchising;
MDIVERGENCE_SUM = market-type divergence measured as the sum of the absolute values of normalized differences on each location characteristic between the store and the average value of the location characteristic for the chain;
MDISPERSION_MULT = market-type divergence measured as the product of the absolute values of normalized differences on each location characteristic between the store and the average value of the location characteristic for the chain; and
MDISPERSION_MAINCLUST = cluster distance between the store's cluster and the most frequent cluster in the chain, weighted by the proportion of the chain's stores in the main cluster.

pursue a strategy of expanding into divergent markets. Similarly, a firm that relies very little on this organizational design choice may deliberately focus its expansion strategy on markets with relatively uniform characteristics in order to avoid the control losses from operating in divergent markets.

To address the potential simultaneous nature of this choice, we consider an instrumental variables approach based on aggregating data across chains.[20] One candidate as an instrumental variable for market-type dispersion is a measure capturing the level of saturation of the main market type served by the chain.[21] This is a good candidate as an instrumental variable since a highly saturated market type may lead the chain to seek new types of markets, leading to higher market-type dispersion, but would not directly influence the franchising decision independent of market-type dispersion. To construct such a measure, we calculate the "level of saturation of each chain's main cluster" (*MAIN_MKT_SAT*) as the number of competitor stores in the cluster (or market type) divided by the total number of zip codes within that cluster. We use this measure as an instrument for our market-type dispersion measure based on cluster analysis, which captures the extent to which chains tend to concentrate their own stores in similar types of markets (*MDISPERSION_HHI*).[22]

Table 8 reproduces the chain-level results reported in Panel B of Table 6 using two-stage least-squares with our cluster-based market-type dispersion measure (*MDISPERSION_HHI*) instrumented by our measure of the saturation of each chain's main market-type saturation (*MAIN_MKT_SAT*). To facilitate the straightforward application of two-stage least-squares, we use the percentage of each chain's stores that are franchised as the dependent variable rather than the categorical variable capturing whether a chain franchises none, some, or all of their stores. The results in column 1 of Table 8 show that market-type dispersion remains a significant determinant of the franchising choice, suggesting that our chain-level results reported in Table 6 are not simply driven by reverse causality. But, the results in column 2 show that the franchising choice is also a significant determinant of market-type dispersion providing some evidence that organizational design and market-expansion strategy choices are made simultaneously.

These findings shed light on those of prior literature that treat characteristics of firm operating environments (e.g., growth, business-unit interdependencies, product diversification) as exogenous determinants of organizational design choices (Abernethy et al. 2004; Bushman et al. 1995; Nagar 2002). Our results demonstrate the possibility that objective features of firm operating environments can be both determinants and outcomes of organizational design choices.

Organizational Design Choices in Non-Franchisor Chains

As shown in Table 2, the majority of chains in our sample (86 percent) do not franchise any of their stores. Given our predictions on the role of franchising in managing heterogeneity in market types, it is interesting to explore whether non-franchisor chains use other forms of decentralization and risk allocation to manage market-type dispersion. These firms may control the problems arising from market dispersion by providing stronger incentive compensation in the form of bonus-based pay to their store managers and by decentralizing their operations more extensively, despite the negative effects of doing so discussed in Section II.

To investigate this possibility, we use a sample of 53 non-franchisor convenience store chains with at least five stores each. This sample of 53 non-franchisors is obtained by matching (1) market and geographic dispersion data calculated from the TDLinx data and U.S. Census data described above, and (2) data from two chain-level surveys conducted in

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[20] We thank an anonymous reviewer for this suggestion.

[21] The main market type served by the chain is the cluster with the highest percent of stores from that chain.

[22] Results are substantively similar when we use either of the other two Market-Type Dispersion measures.

TABLE 8
Simultaneous Estimation of the Relationship between the Percentage of Units Franchised and Market-Type Dispersion
(n = 420 Chains)

	Predicted	*CHAIN_FRANCHISE*	Predicted	*MDISPERSION_HHI*
CHAIN_STATEHHI	+	0.001		
p-value		0.026		
Log(CHAIN_NSTORES)	?	0.072	?	4.30
p-value		0.057		0.000
SALES_PER_STORE	?	−0.002		
p-value		0.004		
SQFT_PER_STORE	?	−0.017		
p-value		0.339		
MDISPERSION_HHI	+	0.001		
p-value		0.008		
CHAIN_FRANCHISE			+	54.54
p-value				0.000
MAIN_MKT_SAT			+	24.67
p-value				0.024
First-Stage R^2		32%		24%
Second-Stage R^2		31%		22%
n		420		420

Data Sources: TDLinx 2004 Channel Database; 2004 ESRI Business Location File.

Variable Definitions:

CHAIN_FRANCHISE = percentage of stores franchised;

CHAIN_STATEHHI = $\left[1 - \sum_{X=1}^{50} \left(\frac{\text{number of stores in state } X \text{ in chain } i}{\text{total number of stores in chain } i}\right)^2\right] \times 100$;

CHAIN_NSTORES = total number of stores operated by the chain;

SALES_PER_STORE, SQFT_PER_STORE = average weekly sales ($000s) and total square feet (000s) per store operated by the chain, respectively;

MDISPERSION_HHI = $\left[1 - \sum_{X=1}^{25} \left(\frac{\text{number of stores in cluster } X \text{ in chain } i}{\text{total number of stores in chain } i}\right)^2\right] \times 100$; and

MAIN_MKT_SAT = total number of competitor stores in the most frequent cluster in the chain divided by the total number of U.S. zip codes in this cluster.

2004 by the National Association of Convenience Stores (NACS), reporting human resources data ("State of the Industry Survey") and compensation data ("Compensation Survey"). The NACS surveys were conducted for, and used by, members of the association largely for purposes of industry analysis and benchmarking. Using these data, we conduct the following two OLS regressions:

$$CENTRALIZATION_i = f\,(MDISPERSION_i,\ CHAIN\_STATEHHI_i,\ CHAIN\_NSTORES_i) \qquad (12)$$

$$VARIABLEPAY_i = f\,(MDISPERSION_i,\ CHAIN\_STATEHHI_i,\ CHAIN\_NSTORES_i) \qquad (13)$$

where *CENTRALIZATION* is calculated by dividing the number of corporate and supervisory staff by the number of store-level employees; *VARIABLEPAY* is measured as the average store manager bonus divided by the average total pay for the store manager (including both bonus and salary-based pay) in the chain; and *MDISPERSION* is measured as *MDISPERSION_SUM, MDISPERSION_MULT,* or *MDISPERSION_HHI* as described in Section IV. As before, we control for geographic dispersion (*CHAIN_STATEHHI*) and chain size (*CHAIN_NSTORES*).

The results in Table 9 are broadly consistent with the notion that decentralization of operations may be an alternative to franchising as an organizational design choice for managing market-type dispersion. As expected, all measures of market dispersion are negatively and significantly ($p < 0.10$) associated with our measure of *CENTRALIZATION* (i.e., the proportion of corporate and supervisory staff relative to the number of store-level employees). We also find consistent results that market dispersion is positively associated with higher levels of *VARIABLEPAY*, but this result is significant for only one of the market dispersion measures.[23]

There are several potential explanations for these weaker results. First, variable pay in company-owned arrangements is typically small. Franchising seems to be the primary vehicle for introducing strong incentives in this industry. There may simply be low power to detect a link between market-type dispersion and variable pay in company-owned arrangements in this setting. Second, the survey measures we utilize to capture variable pay measure this construct for the "average" store in a chain. If firms vary their internal incentive pay for company-owned managers depending on market characteristics, then we are missing this in our measure. Finally, and most interestingly, managers of company-owned stores are likely to be more risk-averse than franchisees and may command a high-risk premium for undertaking the uncertainty of operating in diverse markets. As a partial substitute for incentive-based pay, it is possible that non-franchising firms monitor decentralized operations through direct mechanisms like increased site inspections, technology, or internal reporting systems.

In summary, the findings above indicate a positive relationship between market-type dispersion and organizational design choices including ownership structure (e.g., franchising), degree of decentralization, and the use of incentive pay. These results provide some of the first empirical evidence on how firms use organizational design choices to mitigate coordination and control problems arising from operating across diverse types of markets.

Note that the paper's inferences are robust to sensitivity tests designed to rule out the possibility that our results are driven by an unobservable "aggressive expansion" strategy whereby franchising is used primarily as a vehicle to finance rapid expansion across multiple markets rather than as an organizational design choice used to mitigate control losses from operating across disperse market types. In particular, we were able to replicate our store-level results for the ten largest chains in the sample that operate franchised and company-owned units. These chains each operate more than 1,000 stores, have been in business for at least ten years (some in excess of 50 years), and have been franchising for at least that long.[24] Our store-level results remain substantively similar in this subsample

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[23] All results reported in Table 9 remain substantively similar when measures of average store size (*SALES_PER_STORE, SQFT_PER_STORE*) are added as additional control variables.

[24] While it is difficult to identify the exact dates at which each company began franchising, our review of several sources including *Entrepreneur Magazine* and company websites as well as our interviews with company representatives and representatives of the National Association of Convenience Stores allowed us to determine that each of these large chains has been franchising for at least a decade or more.

TABLE 9
Chain-Level OLS Regressions Linking Centralization and Variable Pay with Market Dispersion, Geographic Dispersion, and Chain Size
(n = 53 Chains)

	Dependent Variable					
	CENTRALIZATION			*VARIABLEPAY*		
	Model 1	**Model 2**	**Model 3**	**Model 1**	**Model 2**	**Model 3**
CHAIN_STATEHHI	0.0004	0.0005	0.0004	−0.0016	−0.0022	−0.0017
p-value	0.162	0.123	0.210	0.120	0.121	0.176
CHAIN_NSTORES	−0.00003	−0.00003	−0.00002	−0.00003	−0.00004	−0.00004
p-value	0.029	0.011	0.098	0.429	0.391	0.345
MDISPERSION_SUM	−0.0238			0.0421		
p-value	0.007			0.075		
MDISPERSION_MULT		−20.304			32.228	
p-value		0.003			0.435	
MDISPERSION_HHI			−0.1261			0.0875
p-value			0.061			0.421
Constant	0.1489	0.1182	0.2003	0.1102	0.1695	0.1234
p-value	0.000	0.000	0.000	0.038	0.000	0.086
Observations	53	53	53	53	53	53
Adjusted R^2	5.9%	6.2%	6.2%	2.7%	1.6%	1.0%

Data Sources: TDLinx 2004 Channel Database; 2004 ESRI Business Location File; 2004 NACS State of the Industry and Compensation surveys.

Variable Definitions:

CENTRALIZATION = (number of corporate and supervisory staff)/(number of store-level employees);

VARIABLEPAY = (average store manager bonus for chain)/(average store manager bonus + average store manager salary);

CHAIN_STATEHHI = $\left[1 - \sum_{X=1}^{50}\left(\frac{\text{number of stores in state } X \text{ in chain } i}{\text{total number of stores in chain } i}\right)^2\right] \times 100$;

CHAIN_NSTORES = total number of stores operated by the chain;

MDISPERSION_SUM = market-type dispersion measured as the aggregate sum of individual *Normalized Dispersion* measures based on location characteristics (population, income, age, ethnicity, household size);

MDISPERSION_MULT = market-type dispersion measured as the aggregate product of individual *Normalized Dispersion* measures based on location characteristics (population, income, age, ethnicity, household size); and

MDISPERSION_HHI = $\left[1 - \sum_{X=1}^{25}\left(\frac{\text{number of stores in cluster } X \text{ in chain } i}{\text{total number of stores in chain } i}\right)^2\right] \times 100$.

of firms. That the individual outlet-level ownership structure decisions of such large, long-established, and geographically dispersed organizations reveal a *systematic pattern* of franchising in divergent market types and company ownership in nondivergent market types makes it unlikely that the "aggressive expansion through franchising" explanation is driving our results. We were also able to identify that six out of the ten largest firms included in this analysis actually provide significant amounts of financing directly to franchisees. Our store-level results are substantively unchanged when the analysis is limited to the six chains for which we know financing is provided to franchisees. This result provides strong additional evidence that our findings are not driven by aggressive expansion via franchising as a financing mechanism.

VI. CONCLUSIONS

Chain organizations operate units that are typically dispersed across different types of markets, and thus serve significantly divergent customer bases. Such market-type dispersion is likely to compromise the headquarters' ability to monitor the store manager's behavior and adapt to the needs of local customers. In this study we show that chains experiencing higher levels of market-type dispersion are more likely to increase delegation and the provision of incentives through the organizational design choice of franchising, presumably to cope with the control problems described. At the same time, we find evidence that suggests that franchising facilitates a chain's expansion into diverse markets. Additional analyses suggest that non-franchisor chains with higher levels of market-type dispersion tend to decentralize operations to a greater extent and provide higher variable pay.

We note that our study is limited in the extent to which we can explain (1) franchising, as we are unable to observe differences in the franchising contracts utilized by the chains analyzed (e.g., fixed fees, royalties) and we are unable to identify the franchisees (limiting our ability to distinguish franchisees that operate one store from those that operate more than one store); (2) decentralization and variable pay in non-franchisor chains, due to unavailable store-level data; and (3) whether the chain's decisions to become a franchisor and to systematically franchise individual stores in divergent markets are made jointly, due to unavailable longitudinal data. Nevertheless, our results confirm a robust relationship between market-type dispersion and organizational design choices related to the delegation of decision rights and the provision of incentives.

Overall, we view our study as an important first step in understanding how firms use organizational design and internal control systems to manage operations across multiple markets. We believe there is ample opportunity for future research to examine how firms use other aspects of organizational design and internal controls such as standardization, internal-reporting frequency and format, and performance-measurement choices to mitigate control problems arising from operating across multiple markets.

APPENDIX A

Examples of Location Characteristics Driving Customer Demand in Chain Organizations

Population density	(i)	stores located in highly populated (urban) areas experience higher sales growth (Gómez et al. 2003);
	(ii)	customers in less populated (rural) areas are more likely to travel beyond their local market, resulting in lost sales for the rural stores (Miller and Kean 1997);
Household size	(iii)	individuals from larger households prefer generic products and larger brand sizes, they are more price sensitive, and have a higher propensity to use off-price coupons due to the large amount of disposable income they spend in basic consumption items such as groceries (Bawa and Shoemaker 1987; Gupta and Chintagunta 1994; Hoch et al. 1995);
	(iv)	smaller households with lower income respond to promotions for less expensive items, while larger households with higher income are more likely to respond to promotions for larger size more expensive items (Kalyanam and Putler 1997);

(*continued on next page*)

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Per capita income and age	(v) customers who are younger, better educated,[25] and/or wealthier have higher opportunity costs (due to a high marginal value of time), and thus are less price and promotion sensitive (Gupta and Chintagunta 1994; Hoch et al. 1995);
	(vi) wealthier customers are more responsive to displays and feature advertising, consistent with the customers' desire to decrease in-store (displays) and out-store (advertising) search costs (Boatwright et al. 2004);
	(vii) wealthier, better educated, and older customers are likely to place more importance on the quality of service (Mittal et al. 2004);
Ethnicity	(viii) African Americans spend relatively more money on generic grocery purchases than Whites (Wilkes and Valencia 1985);
	(ix) African Americans are likely to place more importance on quality of service than other ethnic groups (Mittal et al. 2004);
	(x) the percentage of African American and Hispanic consumers in an area is associated with higher price sensitivity (Mulhern and Williams 1994; Hoch et al. 1995; Mulhern et al. 1998).

APPENDIX B
Construction of Market-Type Clusters

We identify different types of markets in the United States by clustering all zip code areas (i.e., 29,827 zip codes in our ESRI database reflecting the U.S. Census) into groups with similar location characteristics (i.e., population density, average household size, per capita income, ethnicity, and age). We construct these clusters following three steps (Punj and Stewart 1983; Sharma 1996):

1. We standardize each location variable across the whole sample of zip codes by mean-centering it and dividing it by the location characteristic's standard deviation. Thus, each location variable is measured in terms of the number of standard deviations it deviates from the mean.
2. We estimate an *a priori* cluster solution using a hierarchical centroid clustering technique[26] to (a) determine a candidate number of clusters, and (b) identify an initial partition of the clusters that would not be affected by outliers (i.e., our initial partition does not consider small groups with less than 20 zip codes).
3. Using the *a priori* cluster solution obtained in step 2 as a starting point, we utilize a non-hierarchical (K-means) technique[27] to obtain a final cluster solution. Based on this procedure, we obtain 25 groups of zip codes with an R^2 of 81.1 percent,[28]

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[25] Although we did not have a measure for education, Boatwright et al. (2004) find that wealth and education are highly correlated. Thus, including only one of these variables in our analysis should provide adequate results.

[26] The hierarchical centroid clustering technique aggregates the zip codes into groups by progressively grouping (in each iteration) the two closest zip codes or groups of zip codes, based on the Euclidean distance among their location characteristics (or the average location characteristics in a zip-code group already formed, also known as the centroid of the group). This clustering technique suggests that the number of clusters should be determined at the point at which grouping the next two closest zip codes or groups of zip codes would significantly decrease the homogeneity within groups. A reason to refine the hierarchical cluster solution in step 3 is that once an observation is assigned to a cluster, hierarchical clustering does not allow that it be reassigned to another cluster.

[27] The *a priori* cluster solution from the hierarchical clustering consists of 25 clusters and their respective centroids (average location characteristics within the cluster). The non-hierarchical K-means technique reassigns the zip codes in the *a priori* cluster solution to the cluster whose centroid is closest and then recalculates the new centroids of the 25 new clusters. Reassignment continues until every case is assigned to the cluster with the nearest centroid and no further changes occur in the clusters.

[28] The R^2 is the ratio between (the standard deviation between groups) and (the sum of the standard deviation between groups and the standard deviation within groups).

and R^2s that range between 77 (for the average household size) and 85 percent (for the degree of ethnicity) for the five location characteristics, suggesting our cluster solution has a reasonable level of homogeneity within groups and the clusters are well separated based on all the location variables.

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Who Really Matters? Revenue Implications of Stakeholder Satisfaction in a Health Insurance Company

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ABSTRACT: This study examines the revenue implications of satisfaction measures in a setting with multiple stakeholders. I obtain a proprietary database from a leading health insurance company that measures satisfaction levels of multiple stakeholders, including: (1) clients that purchase insurance plans for their employees, (2) patients who use the insurance plans, and (3) doctors who provide medical services. Using multi-stakeholder satisfaction data over a 20-quarter period, I find that satisfaction measures are multi-dimensional, and that future revenues are positively associated with certain, but not all, dimensions of client, patient, and doctor satisfaction. Drawing on stakeholder theory, I predict that the revenue implications of stakeholder satisfaction vary with the power of different stakeholder groups. Specifically, I examine the moderating effects of the percentage of voluntary patients, business unit age, and market penetration on the relation between stakeholder satisfaction and future revenues, finding evidence consistent with my prediction.

Keywords: *nonfinancial performance measures; customer satisfaction; stakeholder satisfaction; stakeholder theory; health care.*

Data Availability: *Data used in this study are derived from a proprietary source.*

I. INTRODUCTION

Customer satisfaction is one of the most important and most widely used nonfinancial performance measures (e.g., Ittner et al. 1997; Ittner and Larcker 1998; Behn and Riley 1999; Banker et al. 2000; Smith and Wright 2004). Prior research has provided

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mixed evidence on the relation between customer satisfaction and future financial performance. Several studies find positive relations between customer satisfaction and future financial performance (e.g., Ittner and Larcker 1998; Behn and Riley 1999; Banker et al. 2000; Smith and Wright 2004), while other studies find that the financial impact of customer satisfaction varies across industries and firms (Anderson et al. 1997; Ittner and Larcker 1998). Although researchers have conjectured that contextual factors contribute to the mixed findings (Ittner and Larcker 1998; Lambert 1998), little empirical evidence exists on whether and how contextual factors affect the satisfaction-performance linkage.[1]

In addition, customers represent only one of an organization's many stakeholders. *Stakeholder* refers to "any group or individual who can affect or is affected by the achievement of the organization's objectives" (Freeman 1984, 46). Under this definition, organizations must balance the needs of multiple stakeholders including shareholders, customers, employees, suppliers, and creditors. Managers pay attention to the satisfaction of stakeholder groups other than customers because the satisfaction of other stakeholder groups is potentially linked to future financial performance. However, due to a predominant focus on customer satisfaction, prior literature provides little guidance on the performance implications of different stakeholders' satisfaction or the contextual factors that affect the performance implications of stakeholder satisfaction.

The health care industry provides an ideal setting in which to study multiple stakeholders. This setting is characterized by a large variety of contracts that exist with a large number of stakeholders, including doctors, insurance companies, employers, and individual patients, who differ in their objective functions (Abernethy et al. 2007; Eldenburg and Krishnan 2007). I obtain a proprietary database from a leading specialty health benefit plan provider (hereafter, HBP) that measures satisfaction levels of multiple stakeholders: (1) clients that purchase insurance plans for their employees; (2) patients who use the insurance plans; and (3) doctors who provide medical services. Thus, the current study broadens the previous literature on customer satisfaction by examining two additional stakeholders: the third-party payer of the service (the "client") and the third-party provider of the delivered service (the "doctor").

Drawing on the stakeholder theory, I hypothesize that the relative impact on future revenues of stakeholder satisfaction varies with the power of each stakeholder group. Power has been broadly defined as the ability of one social actor, A, to get another social actor, B, to do something that B would not otherwise do (Weber 1947; Dahl 1957; Pfeffer 1981). In particular, stakeholder power increases as an organization's dependence on the stakeholder increases (Mitchell et al. 1997; Jawahar and McLaughlin 2001). I examine three contextual factors that influence the power of each stakeholder group: the percentage of voluntary patients, business unit age, and market penetration. First, the current research setting is characterized by a two-tier customer structure, where services are provided to one party (patients), but purchasing decisions are generally made by another party (clients). HBP serves two different types of patients: voluntary and non-voluntary patients. Non-voluntary patients cannot choose among different insurance products, whereas voluntary patients have the option to choose among different insurance products and pay part or all of their premiums. Although clients tend to have greater influence on the purchasing decision than do patients, and hence have greater power than patients, the power of patients should increase as the percentage of voluntary patients increases. Therefore, I predict that the revenue implications of patient (client) satisfaction increase (decrease) in the proportion of voluntary patients, due to an increase (decrease) in the power of patients relative to clients. Second, drawing on research on the effect of organizational life-cycle stage on stakeholder power, I predict that clients and patients have more power in younger HBP locations, and, therefore, client and patient satisfaction should have greater revenue implications in younger HBP locations than in older locations. In contrast, doctors gain in power as an HBP location enters a more mature stage such that doctor satisfaction should have greater revenue implications in older HBP locations than in younger locations. Third, I hypothesize that the positive relation between stakeholder satisfaction and future revenues should be more pronounced when HBP's market penetration rate is low, giving all three stakeholder groups greater power.

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[1] Exceptions include Banker and Mashruwala (2007) and Dikolli et al. (2007).

I examine the relation between stakeholder satisfaction and future revenues using satisfaction data for all 50 U.S. states and the District of Columbia (hereafter referred to as "51 states") serviced by HBP over a 20-quarter period from 2000 to 2004. The empirical tests progress in three stages. In the first stage, I conduct factor analysis on the satisfaction measures of different stakeholders. I find that satisfaction measures for all three stakeholders have multiple dimensions, indicating that each stakeholder's satisfaction is driven by different factors. In the second stage, I examine the association between the various dimensions of stakeholder satisfaction and future revenues. I find that not all dimensions of stakeholder satisfaction have the same impact on future revenues. Specifically, client satisfaction with the customer service of HBP is more closely associated with future revenues than client satisfaction with the value received for the dollars spent. Patient satisfaction with service provided by HBP doctors and selection of HBP doctors is significantly associated with future revenues, whereas patient satisfaction with coverage is not. I also find that relative doctor satisfaction, i.e., doctors' satisfaction with HBP relative to other insurance plans, is more strongly associated with future revenues than the absolute level of doctor satisfaction.

In the third stage, I examine whether the associations between stakeholder satisfaction and future revenues vary as a function of contingency factors that cause the power of different stakeholders to vary. As predicted, I find that patient satisfaction with service is more strongly associated with future revenues in markets with a higher percentage of voluntary patients, whereas client satisfaction with service is more strongly associated with future revenues in markets with a lower percentage of voluntary patients. I also find that patient satisfaction with service is more strongly associated with future revenues in younger HBP markets than in older markets, whereas relative doctor satisfaction is more strongly associated with future revenues in older HBP markets than in younger markets. I do not find evidence that client satisfaction becomes less important in older HBP markets than in younger markets. Finally, as predicted, I find that client satisfaction with service, patient satisfaction with service, and relative doctor satisfaction are more strongly associated with future revenues in markets with lower market penetration rates, where all three stakeholder groups have greater power.

This study offers several contributions. First, while previous studies of customer satisfaction tend to treat customer satisfaction as a single-dimensional construct, my study shows that satisfaction is multi-dimensional, with each dimension having distinct performance implications. Second, this is the first study to examine the performance consequences of satisfaction levels of different stakeholders simultaneously. Integrating stakeholder theory with accounting research on performance measurement enables this study to yield insights into the relative importance of satisfaction measures in a setting with multiple stakeholders. Finally, this study contributes to an emerging literature that explores the reasons for the mixed evidence on the relationship between customer satisfaction and future financial performance (Banker and Mashruwala 2007; Dikolli et al. 2007).

From a practical perspective, a better understanding of the complex relations between nonfinancial measures and revenues can help companies improve their business models and use nonfinancial measures more effectively in their decisions concerning resource allocation, performance evaluation, and compensation practices.

Section II discusses the research site. Section III reviews the literature and develops hypotheses. Section IV describes the data, measures, and empirical research design. Section V presents the results. Section VI concludes and suggests directions for future research.

II. RESEARCH SITE

This study's research site, HBP, is a leading specialty health benefit plan provider.[2] HBP provides a variety of flexible health insurance plans and operates nationwide. It has approximately 30,000 clients, including about 250 *Fortune* 500 companies that purchase health insurance plans for their employees. HBP has a network of over 25,000 doctors and over 3,000 employees. In 2004, the firm had gross revenues of roughly $3.5 billion.

HBP offices in different states are grouped into eight geographic divisions, each with its own division manager. Managers are accountable for revenues in the regions that they manage. Offices in different states are homogeneous in many aspects of their operations, including organization structure, products and services provided, business cycle, and performance measurement and incentive system, but they vary in size, geographic location, market competition, and patient mix. To the extent that large clients have employees in multiple states, some interdependence exists between the different states.

HBP interacts with three primary stakeholders. HBP negotiates insurance plans with clients, and then the patients (employees of the clients) sign up for these plans. HBP contracts separately with doctors to provide services to patients. When negotiating contracts with clients, HBP sets premiums for renewing clients based on their past claim costs and new clients based on the claim costs for similar clients in similar industries. In setting premiums for clients, HBP also considers the size of the client in regard to group administration (generally the larger the client, the lower the administrative fee) as well as the demographics of the client, as is consistent with general practice in the health insurance industry (Jensen and Morrisey 1990; Porter and Teisberg 2006; Zweifel and Breuer 2006). HBP has two types of patients: voluntary patients and non-voluntary patients. Non-voluntary patients are enrolled under employer-sponsored plans that offer no alternatives to the HBP insurance plan. Voluntary patients are also enrolled under employer-sponsored plans, but they have the option to choose HBP's insurance plan. The premium paid by a voluntary patient may be paid in full by the patient, or partially subsidized by the employer.[3]

In terms of handling claims, HBP has elements of both a fee-for-service (FFS) and a health maintenance organization (HMO) (Jensen and Morrisey 1990). The vast majority of claims (about 95 percent) are submitted through its network of doctors. However, an HBP patient may also choose to go to a non-HBP provider, submit the claim to HBP, and be reimbursed directly by HBP. HBP sets its reimbursements for doctors based on a discounted formula applied to the doctor's usual and customary charges. These reimbursements are subject to caps for each geographic region. Once a doctor's reimbursements are set, the doctor can refile annually and receive increases to their contractual reimbursements.

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[2] Under a confidentiality agreement, I have permission from the research site to use disguised company information to ensure the anonymity of the company.

[3] My sample only includes patients enrolled under an employer-sponsored plan and excludes a minority of the HBP patients who are individual purchasers of insurance policies.

HBP faces a number of national and regional competitors in a market that has become more competitive and more vertically integrated since the 1990s. For example, a large HMO purchased one of HBP's competitors to supplement its medical plan offering. This is consistent with a broad trend in the health care industry, characterized by increasing vertical integration of health care delivery organizations with both upstream and downstream activities (Abernethy et al. 2007). Under these market conditions, HBP believes two factors are the most important drivers of revenue growth. First, meeting or exceeding satisfaction goals promotes growth both by generating more revenue from existing customers and by maintaining HBP's strong reputation in the marketplace. Second, reducing administrative costs promotes growth by resulting in more competitive pricing for prospective and renewing customers. HBP implemented employee bonus plans that include satisfaction for different stakeholders as performance measures in the early 1990s. Consistent with its dual strategy, HBP gives satisfaction goals and cost goals equal weights in the bonus plans. The satisfaction measures for each of the three stakeholders served (doctors, patients, and clients) also are given equal weights to convey the message that each stakeholder is equally important to HBP. The Appendix provides details of the bonus plan for all employees.

III. LITERATURE REVIEW AND HYPOTHESES

Revenue Implications of Stakeholder Satisfaction

The marketing literature suggests that higher customer satisfaction increases customer retention (Fornell 1992), reduces price elasticities (Anderson et al. 1994), lowers marketing costs (Anderson et al. 1994; Zeithaml 2000), and increases repurchase and referral intentions (Cronin and Taylor 1992; Anderson and Sullivan 1993), all of which should improve financial performance. Consistent with this, HBP builds its business model and performance measurement system on the assumption that higher client, patient, and doctor satisfaction leads to greater revenues in the future. The revenue implication of client satisfaction is straightforward. Theoretically, patient satisfaction should have both a direct and an indirect effect on future revenues. The direct effect of patient satisfaction comes from the voluntary patients who have the option to choose or not choose HBP's insurance plan. If these patients are not satisfied with HBP, then they can opt out of HBP's insurance plan, reducing HBP's future revenues. The indirect effect of patient satisfaction comes from the non-voluntary patients who may provide feedback to their employers about their experience with HBP and thereby influence their employers' intention to renew contracts with HBP.

The revenue implications of doctor satisfaction are less obvious than those of client and patient satisfaction. When doctors are dissatisfied with an insurance plan (e.g., because they are not satisfied with the promptness or accuracy of payment for claims submitted to HBP), they may terminate their contracts with the insurance plan. Two things will happen as a result. First, doctors who terminate their contracts with HBP may take loyal patients away with them to other insurance plans. Second, if many doctors terminate their contracts with HBP, the network of doctors available to HBP patients shrinks, perhaps leading HBP's patients and clients to terminate their contracts with HBP and instead contract with other insurance plans with a larger selection of doctors. Either of these consequences reduces HBP's future revenues. Doctor satisfaction may also have an indirect influence on revenues through patient satisfaction. For example, if doctors complain that patients cannot get a certain medication or treatment because of HBP's policies, some patients may become unhappy with HBP and decide to leave.

The above discussion leads to my first set of hypotheses:

H1a: Client satisfaction measures are positively associated with future revenues.

H1b: Patient satisfaction measures are positively associated with future revenues.

H1c: Doctor satisfaction measures are positively associated with future revenues.

Stakeholder Theory

Contingency theory suggests that the relevance of performance measures is influenced by contextual factors (e.g., Shevlin 1996; Chenhall 2003). Consistent with this reasoning, prior studies have documented variations in the relation between customer satisfaction and financial performance (e.g., Anderson et al. 1997; Ittner and Larcker 1998; Nagar and Rajan 2005). However, with the exception of Banker and Mashruwala (2007) and Dikolli et al. (2007), little empirical evidence exists on contextual factors that moderate the positive effects of customer satisfaction on future financial performance. In addition, customers are only one of an organization's many stakeholders. Due to prior literature's predominant focus on customer satisfaction, we know little about the performance implications of different stakeholders' satisfaction or the contextual factors that potentially cause the performance implications of stakeholder satisfaction to vary.

Stakeholder theory sheds light on how the relative importance of different stakeholder groups varies contemporaneously and over time. Introduced by Freeman (1984), stakeholder theory suggests that, for organizations to be effective, they need to manage stakeholder relationships that are important. Different theorists converge on the importance of power in prioritizing among stakeholders (Hill and Jones 1992; Mitchell et al. 1997; Jawahar and McLaughlin 2001). As noted in the introduction, power has been broadly defined as the ability of one social actor, A, to get another social actor, B, to do something that B would not otherwise do (Weber 1947; Dahl 1957; Pfeffer 1981; Mitchell et al. 1997). Researchers have drawn on resource dependence theory (Pfeffer and Salancik 1978) to explain the power of stakeholders (Hill and Jones 1992; Mitchell et al. 1997; Jawahar and McLaughlin 2001). Resource dependence theory, which conceptualizes an organization as being dependent on resources in its environment for its survival, argues that organizations will be more concerned with groups that control critical resources to ensure continued survival. For example, labor shortages arising from unexpected changes in the economic environment will increase the power of employees relative to managers, enabling employees to negotiate higher salaries and better benefits from managers. Extending resource dependence theory to stakeholders suggests that the power of stakeholders depends on the extent to which the stakeholders control resources critical to the survival of an organization.

Empirical studies support the argument that organizations prioritize among stakeholders based on stakeholder power. For example, in a sample of insurance companies, Kreiner and Bhambri (1991) find that organizations pay more attention to public policy issues raised by more powerful stakeholders. Using a sample of 130 major corporations that were investigated by the Council on Economic Priorities, Roberts (1992) find that measures of stakeholder power are significantly related to the levels of corporate social disclosure. Agle et al. (1999) find survey evidence that stakeholder power is a major determinant of the degree to which top mangers give priority to stakeholders.

Applying stakeholder theory to the HBP setting, I predict that the varying power of different stakeholders will be manifest in the strength of stakeholder satisfaction-performance linkages. That is, the satisfaction level of a more powerful stakeholder group should matter more to future revenues than the satisfaction level of a less powerful stakeholder group. For example, if clients, rather than patients, make most of the purchasing decisions, then clients have more power than patients because HBP depends on clients to a greater extent for its revenues and, hence, its survival and growth. This translates into a stronger satisfaction-revenue linkage for clients than patients because when clients are not satisfied, they can switch to a different health insurance plan and take revenues away from HBP. Patients, on the other hand, cannot easily penalize HBP by switching to a different provider even if they are dissatisfied with HBP. Thus, depending on the power of the stakeholders, performance implications of stakeholder satisfaction differ across various stakeholder groups and can even differ for the same stakeholder group over time. Therefore, the following sets of hypotheses are based on HBP-specific factors that cause the power of the three stakeholder groups to vary.

Purchasing Influence and the Relative Importance of Stakeholder Satisfaction

Although the purchasing decision is made jointly in any two-tiered customer structure, there is variation in the purchasing influence of the client versus the end-consumer (the patient). Since clients tend to have greater influence on the purchasing decision than do patients, the former have more power. Therefore, client satisfaction should be more strongly associated with future revenues than patient satisfaction. However, a cleaner test would be to examine the effect of the variation in the power of clients versus patients on the revenue implications of satisfaction measures. The research site provides a unique measure to proxy for such variation. HBP serves two different types of patients: voluntary and non-voluntary patients. While non-voluntary patients do not have much power because their employers make the purchasing decision and payment for them, voluntary patients have greater power because they have the option to choose among different products offered in their benefits packages. Since patients have greater power in markets with a larger proportion of voluntary patients, patient satisfaction should be more important in those markets than in the markets with a smaller percentage of voluntary patients. Conversely, client satisfaction should be more important in markets with a smaller percentage of voluntary patients than in markets with a larger percentage of voluntary patients. Thus, I posit the following hypotheses:

H2a: The proportion of voluntary patients decreases the positive association between client satisfaction and future revenues.

H2b: The proportion of voluntary patients increases the positive association between patient satisfaction and future revenues.

Organizational Life-Cycle Stage and the Relative Importance of Stakeholder Satisfaction

Organizational life-cycle research suggests that the priorities of top management change with organizational life-cycle stages and the dominant problems perceived by managers vary with life-cycle stages (Smith et al. 1985; Kazanjian 1988). Integrating organizational life-cycle research with stakeholder theory, Jawahar and McLaughlin (2001) show that, at any given organizational life-cycle stage, certain stakeholders, because of their potential to satisfy critical organizational needs, will be more important than others. Specifically, they predict that during the early stage of an organization's life cycle, customers will be more important than suppliers because the former have the most potential to influence organizational survival. In contrast, in the more mature stage of an organization's life cycle, suppliers gain more power and become as important as customers because demand usually exceeds supply in this stage, such that it is important for the organization to proactively address the needs of suppliers to ensure its long-term survival and growth.

Drawing on this research, I predict that the life-cycle stage of different HBP locations leads to differences in the power of various stakeholders. I operationalize the life-cycle stage of a given HBP location with its business unit age, which ranges from 1 to 50 years. For younger HBP locations, clients and patients have greater power than do doctors, and therefore client and patient satisfaction should be more important for revenues than doctor satisfaction. As an HBP location gets more mature, the power of doctors increases, as does the importance of doctor satisfaction, which should translate into stronger linkages between doctor satisfaction and future revenues. This leads to the next set of hypotheses:

H3a: Business unit age decreases the positive association between client satisfaction and future revenues.

H3b: Business unit age decreases the positive association between patient satisfaction and future revenues.

H3c: Business unit age increases the positive association between doctor satisfaction and future revenues.

Bargaining Power and the Relative Importance of Stakeholder Satisfaction

Bargaining power, defined as the ability of customers or suppliers to put the firm under pressure, is a specific kind of stakeholder power that finds its root in the economics literature (Porter 1980). When the satisfaction level is low, customers or suppliers with greater bargaining power may switch to alternative providers because they are more likely to get favorable trade terms with alternative providers. In contrast, customers or suppliers with little bargaining power are more likely to stay with the current provider even if they are not perfectly satisfied. For example, Jones et al. (2000) show that customer switching costs, an important determinant of customer bargaining power, moderate the relationship between customer satisfaction and repurchase intentions. Building on prior studies that establish a positive relation between market share and market power (e.g., Boulding and Staelin 1990; Schwalbach 1991; Corones 1993), I use HBP's market penetration rate as a proxy for HBP's market power in each state and a reverse measure of customer and supplier bargaining power. Since clients, patients, and doctors have less power in the markets with a higher market penetration rate, their satisfaction should be less important in those markets than in the markets with a lower market penetration rate. Thus, I posit the following hypotheses:

H4a: Market penetration rate decreases the positive association between client satisfaction and future revenues.

H4b: Market penetration rate decreases the positive association between patient satisfaction and future revenues.

H4c: Market penetration rate decreases the positive association between doctor satisfaction and future revenues.

IV. SAMPLE, VARIABLES, AND RESEARCH DESIGN

Sample

The sample consists primarily of quarterly data obtained from HBP on financial and satisfaction measures for 51 states over 20 quarters, from the first quarter of 2000 through the fourth quarter of 2004. I supplement these data with market penetration and patient mix information obtained from the HBP Marketing Department. In addition, I collect quarterly data from the Bureau of Economic Analysis on economic conditions in the states during the same period. To gain familiarity with the business environment of HBP, I spent two days at the firm's national headquarters discussing the project with the CFO and managers in the Customer Service Department. I also had numerous phone and email discussions with the CFO, VP Marketing, and Customer Service managers and employees during the data-collection period. Finally, I reviewed internal company documents about the performance measurement and incentive system.

Dependent Variable

Since HBP's payment to doctors is predetermined by the contracts and may or may not be based on services provided, the cost of treatment is not directly paid by the insurance company. Therefore, I focus on revenue as my dependent variable. *Revenue* is measured as the natural logarithm of quarterly sales revenue for each state.

Satisfaction Variables

Client Satisfaction

The firm measures client satisfaction for a stratified random sample of clients purchasing a health plan each quarter. The survey is administered by email for all clients with an email address and via regular mail for remaining clients. The average initial sample size is 2,500 each quarter and the average final sample size is 650, resulting in an average response rate of 26 percent. The firm measures client satisfaction based on a questionnaire. To maintain comparability across time, I retain 18 questions that are common throughout the 20 quarters in the sample period. Panel A of Table 1 presents results of a principal component factor analysis with oblique rotation, allowing the factors to be correlated.[4] Two factors have eigenvalues greater than 1. I label the first factor "Client satisfaction with customer service" and the second factor "Client satisfaction with value." Given that these two factors emerge consistently as separate dimensions across divisions and over time, I construct weighted indexes for these two client satisfaction dimensions using factor scores.

Patient Satisfaction

The firm measures patient satisfaction for a random sample of patients who use their health care benefits within each quarter. This survey is administered via mail. The initial sample size averages 3,500 each quarter and the final sample size averages 630, yielding an average response rate of 18 percent. The firm measures customer satisfaction based on a questionnaire. I retain 20 questions that are common throughout the 20 quarters in the sample period for comparability purposes. Panel B of Table 1 presents the results of principal component factor analysis with oblique rotation. Three factors have eigenvalues greater than 1. The first factor is "Patient satisfaction with coverage"; the second factor is "Patient satisfaction with quality of service"; and the third factor is "Patient satisfaction with convenience." I construct weighted indexes for the three dimensions of patient satisfaction based on factor scores.

Doctor Satisfaction

The firm measures doctor satisfaction for a random sample of doctors who contract with HBP each quarter. The survey is administered via mail. The average initial sample

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[4] The Varimax rotation method, which assumes orthogonality between the factors, yields similar results.

TABLE 1
Exploratory Factor Analysis of Satisfaction Measures

Panel A: Client Satisfaction

Survey Questionnaire Items	**Factor 1**	**Factor 2**
The ease of doing business with HBP	0.571	0.326
Your HBP account executive's responsiveness to your questions	0.945	−0.094
Thoroughness with which your issues are resolved by your HBP account executive	0.937	−0.068
Your HBP account executive's knowledge of HBP products and services	0.875	−0.043
Your HBP account executive's ability to advise you on your organization's benefits strategy	0.815	−0.035
Your HBP account executive's frequency of contact to meet your needs	0.814	−0.005
Your other HBP service contacts' accessibility to answer your questions	0.914	−0.036
Your other HBP service contacts' responsiveness to your questions	0.937	−0.052
Thoroughness with which your issues are resolved by your other service contacts	0.918	−0.029
Courtesy shown to you by your other service contacts	0.878	−0.043
Effectiveness of HBP's communications with you	0.763	0.113
Effectiveness of HBP's communications with your employees/members	0.634	0.225
The accuracy of your monthly bill	0.526	0.238
HBP's ability to meet your reporting needs	0.557	0.274
HBP's ability to provide a plan that meets the organization's need	0.347	0.561
The value received for the dollars spent on your HBP plan	0.167	0.710
Selection of HBP doctors from which your employees can choose	−0.089	0.909
Your employees'/members' satisfaction with HBP doctors	−0.003	0.884
Percentage of variance explained	64.731	6.439
Cronbach's alpha	0.872	0.854
Labels for factors	Customer Service	Value

Panel B: Patient Satisfaction

Survey Questionnaire Items	**Factor 1**	**Factor 2**	**Factor 3**
Selection of materials in your HBP doctor's office that were fully covered by your plan	0.533	0.218	0.049
Your understanding of the plan	0.481	−0.039	0.372
Amount of coverage provided by your plan	0.826	−0.072	0.118
Amount of coverage in exam	0.887	0.000	−0.043
Amount of coverage in medical materials	0.901	0.005	−0.047
Amount of coverage in specialty materials	0.890	−0.008	−0.099
Amount of coverage in optional materials	0.884	−0.046	−0.087
Value received for the dollars you spent on your care	0.740	0.130	0.060
Ease of using your plan	0.419	0.102	0.390

(*continued on next page*)

TABLE 1 (continued)

Survey Questionnaire Items	Factor 1	Factor 2	Factor 3
Rate your HBP doctor in thoroughness of your exam	−0.004	0.911	0.029
Rate your HBP doctor in explanation of diagnosis and treatment	−0.032	0.930	0.007
Rate your HBP doctor in personal interest and courtesy	−0.046	0.886	0.046
Length of time you waited to receive your service	0.266	0.362	0.197
Quality of service	0.395	0.399	0.110
Rate your HBP doctor or staff's explanation of your overall coverage	0.354	0.394	0.141
Overall experience with your HBP doctor	0.079	0.848	−0.026
Selection of HBP doctors	0.237	−0.102	0.693
Rate your HBP doctor in convenience of location	−0.109	0.025	0.893
Rate your HBP doctor in convenience of office hours	−0.051	0.159	0.780
Rate your HBP doctor in length of time between setting an appointment and your visit	−0.024	0.249	0.653
Percentage of variance explained	52.260	10.296	4.266
Cronbach's alpha	0.933	0.910	0.835
Labels for factors	Coverage	Quality of Service	Convenience

Panel C: Doctor Satisfaction

Survey Questionnaire Items	Factor 1	Factor 2
Ease of doing business with HBP	0.681	0.205
Ease of administering HBP's plans	0.658	0.134
Ease of explaining HBP's plans to patients	0.614	0.117
Promptness of payment for claims submitted	0.849	−0.043
Accuracy of payment for claims submitted	0.877	−0.052
Ease of using your remittance advice	0.769	−0.023
Resolution of payment issues	0.888	−0.049
Ease of obtaining eligibility/plan information	0.778	−0.046
Usefulness of HBP doctor communications	0.711	0.058
Responsiveness of HBP employee in resolving your issues	0.764	0.037
Overall satisfaction with HBP compared to other plans you participate in	0.115	0.752
Rate how HBP compares to other plans you participate in fairness of reimbursement fees for services provided	0.008	0.791
Rate how HBP compares to other plans you participate in providing information/training on products and plans	0.022	0.767
Rate how HBP compares to other plans you participate in supporting private practice doctors in remaining competitive	−0.026	0.837
Rate how HBP compares to other plans you participate in patients' understanding of what their plan covers	−0.028	0.640
Percentage of variance explained	52.664	9.843
Cronbach's alpha	0.817	0.876
Labels for factors	Absolute Doctor Satisfaction	Relative Doctor Satisfaction

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Panels A through C present results from principal component factor analysis with oblimin rotation.

size is 2,400 and the average final sample size is 936, resulting in an average response rate of 39 percent. The firm measures doctor satisfaction using a questionnaire with 15 questions. Panel C of Table 1 presents the results of principal component factor analysis with oblique rotation, which yields two dimensions of doctor satisfaction with eigenvalues greater than 1. The first dimension assesses doctors' absolute satisfaction level with HBP's service and support, and the second dimension assesses their relative satisfaction level with HBP's services and support when comparing HBP with other plans in which they participate. I label these two dimensions "Absolute doctor satisfaction" and "Relative doctor satisfaction," respectively, and construct factor-score-weighted indexes for each dimension.

Moderating Variables

Percentage of Voluntary Patients: I measure percentage of voluntary patients for each state by dividing the number of voluntary patients by the total number of HBP patients. I obtain this data for 16 quarters from 2001 through 2004.

Business Unit Age: Business unit age is measured as the number of quarters since each HBP location was first established.

Market Penetration Rate: I measure market penetration rate for each state by the percentage of the total state population comprising HBP patients.

Control Variables

Economic Conditions: General economic conditions have a direct impact on revenues of firms in the health care industry. Favorable economic conditions enable employers to spend more money on health care benefits for their employees and allow voluntary patients to purchase optional health care insurance. Therefore, I control for economic conditions, as measured by quarterly state personal income. This measure tracks the level of personal income received by people who live or work in a state. I collect this data from the website of the Bureau of Economic Analysis (http://www.bea.gov).

Past Performance: I include past performance to control for time-series trends as well as to examine whether the satisfaction measures provide incremental information on future performance (Ittner and Larcker 1998). I measure past performance with a one-year lag to control for seasonality.

Dummy for Fourth Quarter: I control for the fourth quarter because I observe a large increase in revenues in the fourth quarter of each year. Conversations with HBP personnel reveal two prominent reasons for this pattern. First, clients tend to accelerate costs for tax purposes through prepayment of medical benefits insurance in the fourth quarter. Second, contracts tend to be negotiated and renegotiated in the fourth quarter.

Research Design

Lambert (1998) argues that estimating the relation between customer satisfaction and future financial performance in first differences is more desirable than levels-on-levels specification, in the sense that a change model better captures the relation between a "surprise" component in customer satisfaction and a change in performance. Using a change model also controls for a possible firm-specific fixed effect. Therefore, to test the research hypotheses, I estimate the following regression equation based on a change model.

$$\Delta Revenue_t = \beta_0 + \sum_{m=1}^{7} \beta_m \Delta SatVar_m + \sum_{n=8}^{10} \beta_n ModVar_n + \sum_{p=11}^{31} \beta_p \Delta SatVar_p \times ModVar_p + \sum_{q=32}^{34} \beta_q Controls_q + \varepsilon_{i,t} \quad (1)$$

where $SatVar_m$ stands for the seven satisfaction variables and $ModVar_n$ stands for the three moderating variables: Percentage of Voluntary Patients (*PercVol*), Business Unit Age (*Business unit age*), and Market Penetration Rate (*MktPnt*) (defined below). I demean the continuous variables in the interaction terms to mitigate multicollinearity concerns (Aiken and West 1991). Because the estimation is cross-sectional with a wide variety of business units and large differences in the size of the business units, I take logs of both the independent variables and dependent variables to alleviate potential heteroscedasticity. The main variables are defined as follows:

Dependent variable:

Revenue = natural log of gross revenue.

Satisfaction variables (*SatVar*): Satisfaction variables are created by aggregating questionnaire item scores weighted by factor loadings from factor analysis with oblimin rotation (Table 1). Each observation represents a state-quarter. The satisfaction measures are elicited with five-point scales, where 1 indicates "Poor" and 5 indicates "Excellent":

ClnSat_Service = natural log of client satisfaction with customer service;
ClnSat_Value = natural log of client satisfaction with value;
PatSat_Coverage = natural log of patient satisfaction with coverage;
PatSat_Service = natural log of patient satisfaction with quality of service;
PatSat_Convenience = natural log of patient satisfaction with convenience;
DocSat_Abs = natural log of absolute doctor satisfaction; and
DocSat_Rel = natural log of relative doctor satisfaction.

Moderating variables (*ModVar*):

PercVol = percentage of HBP patients who can choose among different insurance products and pay part or all of their insurance premiums;
Business unit age = number of quarters since the HBP location is established in a state; and
MktPnt = percentage of HBP patients out of the entire population in each state.

Control variables (*Controls*):

Rev_{t-4} = natural log of gross revenue in quarter $t-4$;
StateInc. = natural log of total income received by people who live or work in a state; and
Dummy_4th quarter = 1 if the quarter is the fourth quarter, and 0 otherwise.

All change variables are first differences.

Prior research suggests that the length of lag between customer satisfaction and future financial performance varies across firms. For example, Banker et al. (2000) document a six-month lead-lag relation between customer satisfaction and financial performance in the hospitality industry, whereas Bernhardt et al. (2000) detect a one-year lag in the fast-food restaurant industry. In the current research setting, the contracts between HBP and its clients, doctors, and patients provide some information about lags. Most clients have two-year contracts with HBP, and most patients have one-year contracts. All doctors have evergreen contracts with HBP, which allow either party to terminate the contract with 90 days of notice. Accordingly, I use eight-quarter lags for client satisfaction, four-quarter lags for patient satisfaction, and one-quarter lags for doctor satisfaction. I use contract length because satisfaction within the contract period will increase repeat business and thus future revenues. However, since the choice of time lags between various satisfaction measures and future revenues is somewhat arbitrary, I also test alternative lags as a robustness check.

V. RESULTS

Table 2 provides descriptive statistics for the variables. Although I use the "change" form of the variables in the regression model, I also provide descriptive statistics for the "level" form of the variables to facilitate interpretation. The mean gross revenue generated by each state in each quarter is \$15.59 million (median = \$15.88 million). The average HBP location has 45 percent voluntary patients (median = 38 percent), has been established for about 10 years (39.77 quarters, median = 39 quarters), and has a market share of 11 percent (median = 9.70 percent). HBP locations in different states vary considerably by the three moderating variables: percentage of voluntary patients (Std. Dev. = 27 percent), business unit age (Std. Dev. = 26 quarters), and market penetration rate (Std. Dev. = 7 percent).

Table 3 presents Pearson correlations among the variables used to test the hypotheses. The changes in satisfaction measures for each stakeholder exhibit significant correlations within each stakeholder, but weak correlations across stakeholders. Changes in both measures of client satisfaction (*ClnSat_Service* and *ClnSat_Value*) are positively correlated with changes in both measures of doctor satisfaction (*DocSat_Abs* and *DocSat_Rel*). Change in patient satisfaction with convenience is positively correlated with change in the absolute level of doctor satisfaction as well as with changes in both measures of client satisfaction (*ClnSat_Service* and *ClnSat_Value*). These results suggest positive associations between client satisfaction and doctor satisfaction as well as between patient satisfaction with convenience and client satisfaction, but I find no association between patient satisfaction and doctor satisfaction.

Regarding the association between changes in satisfaction measures and changes in revenue, changes in measures of client satisfaction are significantly positively correlated with changes in revenues, as are the changes in measures of doctor satisfaction. The correlations between changes in two measures of patient satisfaction (satisfaction with coverage and satisfaction with convenience) and change in revenues are insignificant, whereas the correlation between the change in a third measure of patient satisfaction (satisfaction with quality of service) and change in revenues is significantly positive. Change in current revenue is significantly negatively correlated with change in lagged revenue; suggesting a strong negative serial correlation in change in revenue.

These univariate results suggest that stakeholder satisfaction measures are multidimensional, and that each dimension has distinct implications for revenues and the satisfaction levels of the other stakeholders.

TABLE 2
Descriptive Statistics

Variable	n	Mean	Std. Dev.	Q1	Median	Q3
ClnSat_Service	1020	1.38	0.10	1.33	1.39	1.45
ClnSat_Value	1020	1.33	0.13	1.28	1.35	1.40
PatSat_Coverage	1020	1.25	0.12	1.19	1.26	1.33
PatSat_Service	1020	1.45	0.08	1.41	1.46	1.49
PatSat_Convenience	1020	1.40	0.09	1.35	1.40	1.45
DocSat_Abs	1020	1.24	0.10	1.18	1.25	1.31
DocSat_Rel	1020	1.43	0.06	1.39	1.44	1.47
Revenue (millions of dollars)	1020	15.59	1.72	14.55	15.88	16.75
StateInc (millions of dollars)	1020	11.53	1.06	10.65	11.58	12.32
PercVol	816	0.45	0.27	0.69	0.38	0.23
Business unit age	1020	39.77	25.97	48.00	39.00	27.00
MktPnt	1020	0.11	0.07	0.06	0.097	0.15
Δ*ClnSat_Service*	936	0.006	0.119	−0.056	0.007	0.061
Δ*ClnSat_Value*	936	0.007	0.150	−0.060	0.007	0.076
Δ*PatSat_Coverage*	936	0.001	0.169	−0.082	−0.001	0.087
Δ*PatSat_Service*	936	0.000	0.107	−0.053	0.003	0.055
Δ*PatSat_Convenience*	936	0.002	0.129	−0.060	0.003	0.063
Δ*DocSat_Abs*	936	0.000	0.059	−0.023	0.000	0.025
Δ*DocSat_Rel*	936	0.002	0.099	−0.046	0.003	0.051
Δ*Revenue* (millions of dollars)	936	0.134	0.702	0.274	0.386	0.649
Δ*StateInc* (millions of dollars)	936	0.011	0.011	0.005	0.010	0.016

Variable Definitions:

Satisfaction variables are created by aggregating questionnaire item scores weighted by factor loadings from factor analysis with oblimin rotation (Table 1). Each observation represents a state-quarter. The satisfaction measures are elicited with five-point scales, where 1 indicates "Poor" and 5 indicates "Excellent."

ClnSat_Service = natural log of client satisfaction with customer service;
ClnSat_Value = natural log of client satisfaction with value;
PatSat_Coverage = natural log of patient satisfaction with coverage;
PatSat_Service = natural log of patient satisfaction with quality of service;
PatSat_Convenience = natural log of patient satisfaction with convenience;
DocSat_Abs = natural log of absolute doctor satisfaction; and
DocSat_Rel = natural log of relative doctor satisfaction.

Other variables:

Revenue = natural log of gross revenue;
StateInc = natural log of total income received by people who live or work in a state;
PercVol = percentage of HBP patients who can choose among different insurance products and pay part or all of their insurance premiums;
Business Unit Age = number of quarters since the HBP location is established in a state; and
MktPnt = percentage of HBP patients out of the entire population in each state.

All changes variables are first differences.

Table 4 reports results for tests of H1 through H4. The coefficients β_1 to β_7 in Equation (1) test H1a through H1c, which predict positive associations between measures of stakeholder satisfaction and future revenue. Results indicate that some, but not all, dimensions of stakeholder satisfaction measures are positively related to future revenues. Consistent

TABLE 3
Correlation Matrix

	1	2	3	4	5	6	7	8	9	10	11	12
1. *ΔClnSat_Service*	1.000											
2. *ΔClnSat_Value*	0.641**	1.000										
3. *ΔPatSat_Coverage*	0.052	0.062	1.000									
4. *ΔPatSat_Service*	0.020	0.035	0.524**	1.000								
5. *ΔPatSat_Convenience*	0.091*	0.085*	0.582**	0.629**	1.000							
6. *ΔDocSat_Abs*	0.252**	0.197**	0.008	−0.005	0.071*	1.000						
7. *ΔDocSat_Rel*	0.099*	0.129**	−0.005	0.032	0.047	0.681**	1.000					
8. *ΔRevenue*	0.156**	0.196**	0.018	0.079*	0.063	0.266**	0.347**	1.000				
9. *ΔStateInc*	0.138**	0.155**	0.017	0.053	0.026	0.284**	0.352**	0.744**	1.000			
10. *PercVol*	−0.019	−0.023	−0.008	0.026	0.025	0.012	0.080*	−0.187**	0.137**	1.000		
11. *Business Unit Age*	0.094**	0.130**	0.004	0.033	0.074*	0.214**	0.227**	0.406**	0.326**	−0.212**	1.000	
12. *MktPnt*	−0.019	−0.154**	0.041	−0.033	0.098**	−0.058	−0.075*	0.394**	−.018	−0.382**	0.341**	1.000

*, ** Correlation is significant at the 0.05 percent, and 0.01 percent levels (two-tailed), respectively.

See Tables 1 and 2 for variable definitions.

TABLE 4
Ordinary Least-Squares Regression Examining the Association between Changes in Satisfaction Measures and Changes in Future Revenue for the 20-Quarter Period 2000–2004

$$\Delta Revenue_t = \beta_0 + \sum_{m=1}^{7} \beta_m \Delta SatVar_m + \sum_{n=8}^{10} \beta_n ModVar_n + \sum_{p=11}^{31} \beta_p \Delta SatVar_p \times ModVar_p + \sum_{q=32}^{34} \beta_q Controls_q + \varepsilon_{i,t} \quad (1)$$

Variable	Predicted Sign	Coefficient (t-statistic)
β_0	+/−	−0.160 (−0.23)
$\Delta ClnSat\_Service_{t-8}$	+	0.257*** (2.39)
$\Delta ClnSat\_Value_{t-8}$	+	0.010 (0.32)
$\Delta PatSat\_Coverage_{t-4}$	+	−0.029 (−0.97)
$\Delta PatSat\_Service_{t-4}$	+	0.358** (2.19)
$\Delta PatSat\_Convenience_{t-4}$	+	0.253* (1.63)
$\Delta DocSat\_Abs_{t-1}$	+	0.215 (1.19)
$\Delta DocSat\_Rel_{t-1}$	+	0.714*** (2.39)
PercVol	?	−0.041 (−0.71)
Business Unit Age	?	0.049 (0.73)
MktPnt	?	0.063 (0.97)
$\Delta ClnSat\_Service_{t-8} \times PercVol$	−	−0.081*** (−2.58)
$\Delta ClnSat\_Value_{t-8} \times PercVol$	−	0.061 (0.56)
$\Delta PatSat\_Coverage_{t-4} \times PercVol$	+	0.133 (1.02)
$\Delta PatSat\_Service_{t-4} \times PercVol$	+	0.167* (1.41)
$\Delta PatSat\_Convenience_{t-4} \times PercVol$	+	0.088 (0.57)
$\Delta DocSat\_Abs_{t-1} \times PercVol$	+/−	−0.207 (−0.47)
$\Delta DocSat\_Rel_{t-1} \times PercVol$	+/−	0.293 (0.97)
$\Delta ClnSat\_Service_{t-8} \times Business\ Unit\ Age$	−	−0.042 (−0.43)
$\Delta ClnSat\_Value_{t-8} \times Business\ Unit\ Age$	−	−0.062 (−0.61)

(continued on next page)

TABLE 4 (continued)

Variable	Predicted Sign	Coefficient (t-statistic)
$\Delta PatSat\_Coverage_{t-4} \times Business\ Unit\ Age$	−	0.243 (0.71)
$\Delta PatSat\_Service_{t-4} \times Business\ Unit\ Age$	−	−1.025*** (−2.46)
$\Delta PatSat\_Convenience_{t-4} \times Business\ Unit\ Age$	−	0.329 (0.97)
$\Delta DocSat\_Abs_{t-1} \times Business\ Unit\ Age$	+	0.428 (0.89)
$\Delta DocSat\_Rel_{t-1} \times Business\ Unit\ Age$	+	0.380* (1.36)
$\Delta ClnSat\_Service_{t-8} \times MktPnt$	−	−0.057* (−1.43)
$\Delta ClnSat\_Value_{t-8} \times MktPnt$	−	−0.035 (−0.22)
$\Delta PatSat\_Coverage_{t-4} \times MktPnt$	−	−0.098 (−0.54)
$\Delta PatSat\_Service_{t-4} \times MktPnt$	−	−0.251* (−1.47)
$\Delta PatSat\_Convenience_{t-4} \times MktPnt$	−	−0.265* (−1.50)
$\Delta DocSat\_Abs_{t-1} \times MktPnt$	−	0.615 (1.50)
$\Delta DocSat\_Rel_{t-1} \times MktPnt$	−	−0.463** (−2.14)
$\Delta Revenue_{t-4}$	−	−0.452*** (−8.38)
$\Delta StateInc_t$	+	−0.006 (−0.10)
Dummy_4th quarter	+	0.293*** (5.44)
Number of Observations	502	
Adjusted R^2	0.331	

*, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively (one-tailed test if signed prediction is provided, two-tailed otherwise).

OLS standard errors are based on state-clustered standard errors. The dependent variable is changes in the natural log of revenues in quarter *t*.

Dummy_4th quarter = 1 if the quarter is the fourth quarter, and 0 otherwise.

See Tables 1 and 2 for variable definitions.

with H1a, $\Delta ClnSat\_Service_{t-8}$ is positively associated with change in revenues ($t = 2.39$; one-tailed $p < 0.01$). However, the association between $\Delta ClnSat\_Value_{t-8}$ and change in revenues is insignificant. These results indicate that client satisfaction with customer service provided by HBP has greater revenue implications than client satisfaction with value. Similarly, as predicted by H1b, changes in two dimensions of patient satisfaction ($\Delta PatSat\_Service_{t-4}$ and $\Delta PatSat\_Convenience_{t-4}$) are positively associated with change in revenues ($t = 2.19$ and 1.63; one-tailed $p = 0.02$ and 0.05, respectively), but the association between change in the third dimension of patient satisfaction ($\Delta PatSat\_Coverage_{t-4}$) and change in revenues is insignificant. These findings indicate that patient satisfaction with customer service and convenience are more predictive of future revenues than patient satisfaction with coverage. Regarding H1c, I find that the coefficient on $\Delta DocSat\_Rel_{t-1}$ is significantly positive ($t = 2.39$; one-tailed $p < 0.01$), whereas the coefficient on $\Delta DocSat\_Abs_{t-1}$ is insignificant, suggesting that doctors' relative level of satisfaction is more important for future revenues than is their absolute level of satisfaction. Overall, these results suggest that not all dimensions of stakeholder satisfaction measures hold the same significance for future revenues.

The coefficients β_{11} to β_{31} in Equation (1) test H2 through H4. H2a predicts client satisfaction to be more important in markets with a smaller percentage of voluntary patients than in markets with a large percentage of voluntary patients. Conversely, H2b predicts that in markets with a larger proportion of voluntary patients, patients have greater purchasing influence and therefore patient satisfaction should be more important than in markets with a smaller proportion of voluntary patients. Consistent with H2a, the coefficient on the interaction term between $\Delta ClnSat\_Service_{t-8}$ and *PercVol* is significantly negative ($t = -2.58$; one-tailed $p < 0.01$), suggesting that client satisfaction with service is less important for future revenues in HBP locations with a higher percentage of voluntary patients. The coefficient on the interaction term between $\Delta ClnSat\_Value_{t-8}$ and *PercVol* is insignificant.

The coefficient on the interaction term between $\Delta PatSat\_Service_{t-4}$ and *PercVol* is positive and marginally significant ($t = 1.41$; one-tailed $p = 0.08$), lending some support to H2b that patient satisfaction with service becomes more important for future revenues in HBP locations with a higher percentage of voluntary patients. The coefficients on the interaction term between changes in the other two dimensions of patient satisfaction ($\Delta PatSat\_Coverage_{t-4}$ and $\Delta PatSat\_Convenience_{t-4}$) and *PercVol* are insignificant. These results suggest that, for those dimensions of client satisfaction and patient satisfaction that are the most germane to future revenues, the revenue implications of client and patient satisfaction measures vary depending on the percentage of voluntary patients that causes the relative power of these two stakeholders to vary.

Hypotheses 3a–3c predict patient and client satisfaction to be more important in younger markets and doctor satisfaction to be more important in older markets. The coefficients on the interaction terms between changes in both dimensions of client satisfaction ($\Delta ClnSat\_Service_{t-8}$ and $\Delta ClnSat\_Value_{t-8}$) and *Business unit age* are insignificant, suggesting that client satisfaction is no less important for future revenues in older HBP locations than in younger HBP locations, so H3a is not supported. Consistent with H3b, the coefficient on the interaction term between $\Delta PatSat\_Service_{t-4}$ and *Business unit age* is significantly negative ($t = -2.46$; one-tailed $p < 0.01$), suggesting that patient satisfaction with service becomes less important for future revenues in older HBP locations. The coefficients on the interaction term between changes in the other two dimensions of patient satisfaction ($\Delta PatSat\_Coverage_{t-4}$ and $\Delta PatSat\_Convenience_{t-4}$) and *Business unit age* are insignificant. Consistent with H3c, the coefficient on the interaction term between $\Delta DocSat\_Rel_{t-1}$ and *Business unit age* is positive and marginally significant ($t = 1.36$; one-tailed $p = 0.09$), suggesting that doctors' relative satisfaction becomes more important for future revenues in older HBP locations than in younger locations. The coefficient on the interaction term between $\Delta DocSat\_Abs_{t-1}$ and *Business unit age* is insignificant. With the exception of client satisfaction, these results suggest that, for those dimensions of stakeholder satisfaction that matter to future revenues, the revenue implications of stakeholder satisfaction vary depending on the organizational life-cycle stage that causes the power of the stakeholders to vary.

Hypotheses 4a–4c predict that the associations between stakeholder satisfaction and future revenues are stronger in those markets in which HBP has a low market penetration rate. Consistent with H4a, the coefficient on the interaction term between $\Delta ClnSat\_Service_{t-8}$ and *MktPnt* is negative and marginally significant ($t = -1.43$; one-tailed $p = 0.08$), suggesting that client satisfaction with service is less important for future revenues in HBP locations with a higher market penetration rate. The coefficient on the interaction term between $\Delta ClnSat\_Value_{t-8}$ and *MktPnt* is insignificant. Consistent with H4b, the coefficients on the interaction term between $\Delta PatSat\_Service_{t-4}$ and *MktPnt* is negative and marginally significant ($t = -1.47$; one-tailed $p = 0.08$). The coefficients on the interaction term between $\Delta PatSat\_Convenience_{t-4}$ and *MktPnt* is also negative and marginally significant ($t = -1.50$; one-tailed $p = 0.07$). These findings indicate that patient satisfaction with both service and convenience becomes less important for future revenues in HBP locations with a higher market penetration rate. The coefficient on the interaction term between $\Delta PatSat\_Coverage_{t-4}$ and *MktPnt* is insignificant. Consistent with H4c, the coefficient on the interaction term between $\Delta DocSat\_Rel_{t-1}$ and *MktPnt* is significantly negative ($t = -2.14$; one-tailed $p = 0.02$), suggesting that doctors' relative satisfaction becomes less important for future revenues in HBP locations with a higher market penetration rate. The coefficient on the interaction term between $\Delta DocSat\_Abs_{t-1}$ and *MktPnt* is insignificant.

The above findings largely support H2 through H4, suggesting that for those dimensions of stakeholder satisfaction that matter to future revenues, the revenue implications of stakeholder satisfaction measures vary depending on contextual factors (specifically, percentage of voluntary patients, business unit age, and market penetration rate) that cause the power of these stakeholders to vary.

The coefficients on the control variables are generally consistent with expectations. The coefficient on change in past revenue is significantly negative ($t = -8.38$; one-tailed $p < 0.01$), suggesting strong negative serial correlation in change in revenue. The coefficient on the fourth-quarter dummy is significantly positive, consistent with clients accelerating costs for tax purposes through prepayment of medical benefits insurance in the fourth quarter as well as increased contract negotiation and renegotiation activities in the fourth quarter. I do not find evidence that change in economic condition is positively associated with change in revenue.

Since the choice of time lags between various satisfaction measures and future revenues is somewhat arbitrary, I test alternative lags with small variations as a robustness check (e.g., four instead of eight quarters of time lag between client satisfaction and future revenues, two instead four quarters of time lag between patient satisfaction and future revenues, two instead of one quarter of time lag between doctor satisfaction and future revenues), and obtain similar results.

VI. CONCLUSION

This study examines the revenue implications of customer satisfaction measures in a setting with multiple stakeholders. I find that stakeholder satisfaction is multi-dimensional, with different revenue implications for each dimension. Specifically, I find that client satisfaction with service, patient satisfaction with service, and relative doctor satisfaction are significantly associated with future revenues, whereas other dimensions of client, patient, and doctor satisfaction are not. More importantly, I find that revenue implications of stakeholder satisfaction vary systematically with contextual factors that cause the power of each stakeholder to vary. Specifically, I find that the percentage of voluntary patients increases the revenue implications of patient satisfaction, but decreases the revenue implications of client satisfaction. I also find that business unit age increases the revenue implications of doctor satisfaction, but decreases the importance of patient satisfaction. Finally, I find that market penetration rate weakens the relation between stakeholder satisfaction and future revenues.

This study has important managerial implications. Results illustrate the importance of considering different dimensions of satisfaction separately. Results also highlight the need to simultaneously consider multiple stakeholders in determining whether satisfaction improvements result in higher revenues. By examining which stakeholder's satisfaction matters the most to revenues under different circumstances, the results of this study can help managers to make more informed decisions related to resource allocation, performance evaluation, and compensation. That said, the implications from this study are not easy to implement, because the contextual factors that affect the power of different stakeholders evolve over time, requiring managers to constantly monitor the performance implications of different stakeholders and revise their strategy and business model accordingly. The practical implication for managers, therefore, is that they should consider the relative importance of stakeholder satisfaction given their current business environment, while remaining flexible to shift resources across satisfaction initiatives targeted at various stakeholder groups.

This study is subject to the following limitations. First, given the unique nature of stakeholders in the current research setting, the empirical results regarding the linkages between stakeholder satisfaction and performance may not fully generalize to more traditional settings.[5] Nonetheless, to the extent that all firms deal with multiple stakeholders and stakeholder theory (with its focus on power) pertains to stakeholders in general, the theoretical arguments of this study about the variations in the satisfaction-performance linkages are likely to apply to a broad cross-section of firms. The contextual factors that determine the variations in the power of different stakeholders will depend on the specific research setting.

Second, data limitations preclude an analysis of the relation between customer satisfaction and future profit in my research setting. I am also unable to examine the relation between customer satisfaction and cost. Previous studies that document mixed evidence between customer satisfaction and profit conjecture that the relationship is driven by cost differences in achieving customer satisfaction (Anderson et al. 1997; Ittner and Larcker 1998). However, my study suggests an alternative explanation that the differences could also be driven by the varying revenue implications of customer satisfaction.

Third, the satisfaction data of this study are from third-party surveys and, as a result, I have no control over the design and administration of the surveys. Discussions with HBP managers revealed that, although they follow some recommended procedures of survey design and administration such as random sampling and follow-ups, they do not follow other procedures such as nonresponse bias analysis (Van der Stede et al. 2005). The use of a change model should alleviate the concern of nonresponse bias to some extent.

Fourth, the limited length of data may hinder the ability to find significant results if the revenue implications of some satisfaction measures take a longer period to be realized than the time frame of the current study. Also, I face the challenge to match customer satisfaction directly with revenue streams in this research setting because I do not have access to data on specific contract renegotiations.

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[5] To the extent that the client in my setting is like a distributor in a supply chain that buys in bulk from a wholesaler and resells to the retailers and the doctor in my setting is like other third-party suppliers of services such as outsource service providers, even the empirical results of the satisfaction-performance linkages may have some generalizability to similar business players in other settings.

Finally, the regression model assumes linear relations between stakeholder satisfaction and future revenues. The true relations, however, could be nonlinear (e.g., Ittner and Larcker 1998). Nonetheless, the recent marketing literature finds the following: (1) over a reasonable range, the assumption of a linear relationship between satisfaction and loyalty is realistic (Yeung et al. 2002); and (2) models that assume nonlinearity between satisfaction and loyalty do not have superior explanatory power over linear models (Streukens and de Ruyter 2004).

Despite the above limitations, this study represents a step toward understanding the complex relations between nonfinancial performance measures, contextual factors, and future financial performance. This study suggests several directions for future research. Future studies could enlarge the research sample by including more firms and industries. More importantly, future research could examine other contextual factors that cause the power of different stakeholders to vary, e.g., switching costs, availability of substitutes, and buyer or supplier concentration.

APPENDIX

Excerpts from HBP's 2004 Bonus Plan for All Employees

In 2004, our bonus goals have been set to continue our progress toward delighting our patients, clients, and doctors. Each factor equates to the indicated percentage of one week's value of pay, totaling one additional week of pay if we achieve 100% for all factors for full-time employees. The bonus for part-time employees will be prorated. The goals are as follows:

		Target to Receive		
Category	**% of Bonus**	**100%**	**75%**	**0%**
Patient Satisfaction	20%	87% or more	83%–86%	82% or less
Client Satisfaction	20%	87% or more	83%–86%	82% or less
Doctor Satisfaction	20%	60% or more	57%–59%	56% or less
Admin Cost/Claim	40%	1% less than 2003	Between 2003 and 1% less	Same as 2003

As an additional incentive, we will add one extra day of pay (equals a bonus factor of 20%) for each additional one-percentage point reduction in our administrative cost per claim, below the target level. Note that the administrative cost per claim target has been adjusted to eliminate some costs related to technology projects and our advertising campaigns.

The satisfaction goals are based on the "excellent" and "very good" ratings.

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Market Efficiencies and Drift: A Computational Model

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ABSTRACT: Accounting and finance researchers show semi-strong form efficiency or lack thereof by using sequences of prices from Center for Research in Security Prices (CRSP) and Compustat data for which there is no model for how these prices arise from individual decisions. One needs a setting in which prices (including bids and asks) as well as information about individuals making the choices are both available. To begin to bridge the gap between theory and data, we extend work done by experimental economists on the double auction and model price formation that is or is not semi-strong efficient. Agents in the model uncover prices in a manner consistent with Hayek's notion of price discovery (Hayek 1948).

Keywords: *market efficiency; drift; computational model; agent-based simulation.*

Data Availability: *Data are available on request.*

> What individual has chosen prices? In the formal theory, at least, no one. They are determined on (not by) social institutions known as markets, which equate supply and demand. ... The failure to give an individualistic explanation of price formation has proved to be surprisingly hard to cure.
>
> —Arrow (1994, 4)

I. INTRODUCTION

For 40 years, accountants using archival data have sought an understanding of the relationship between stock price behavior and information (and, in particular, accounting information). The issue described by Arrow (1994) is always apparent in

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this research, namely, that there is no "individualistic" explanation of how prices in archival data are formed. Accountants show semi-strong form efficiency or lack thereof by using sequences of prices from Center for Research in Security Prices (CRSP) and Compustat data, but without a model of how these prices arise from individual decisions. The fact that such a puzzle has been unsettled for so long suggests that it will not be resolved completely overnight. One needs a setting in which prices (as well as bids and asks) and information about individuals making the choices are available. To begin to bridge the gap between theory and data, we extend work done by experimental economists on the double auction to model price formation that is/is not semi-strong efficient.

A related motivation stems from the recent financial collapse; it has produced challenges to the viability of economic thought underlying policy selection (and, in particular, the efficient market hypothesis). Given Alan Greenspan's admission of over-reliance on the efficient market hypothesis, it seems that showing when such a hypothesis holds could contribute to a better understanding of the forces underlying economic disorder.

We use a general computational model of price formation with risky assets to give insight into the type of structure that can support many of the (at times, apparently conflicting) results. In principle, this model applies to any setting with a finite set of actors who behave according to any well-known risk-preference structure (expected utility, prospect theory, rank-dependent utility theory), and is void of strong (rational expectations) informational knowledge on the part of actors in the economies. The model is general, yet it is computational in that it is not of a closed form, and yields testable propositions when parameters are specified explicitly. In this sense, it offers more than just experimental and/or agent-based simulation results; rather, it offers an entire framework to examine theoretical predictions across a wide set of parametric specifications and contexts.

Background Literature

Experimental economics has spawned an extensive literature, one aim of which is to understand how individuals behave in double auctions. These auctions have been objects of study because they bear resemblance to real-world trading institutions such as the New York Stock Exchange (NYSE) and the Chicago Mercantile Exchange. Fundamental research on double auction markets was conducted in a series of experiments summarized by Plott (1982) and Smith (1982), which demonstrated that a competitive equilibrium (prices, quantities, and consumer surplus) can be achieved.

Results from double auction experiments did not come without an accompanying puzzle: Why did the prices arrive where they did? After all, market participants had only limited information; they did not know the private valuations of other traders, nor the equilibrium price, but only the rules of the game and their own valuations. The work of Easley and Ledyard (1993), Cason and Friedman (1993, 1996), and Wilson (1987) provide theoretical and empirical insight into how this convergence might occur. Gode and Sunder (1993) provide a dramatic example of how a very simple computer representation of each individual agent (a *zero-intelligence agent*) allowed such agents to arrive at the competitive equilibrium consumer surplus. In their agent-based simulation, agents were not concerned with any historical information about previous behavior in the market, so that prices did not necessarily inform them what the next observable price would be. Gjerstad and Dickhaut (1998) explore how historical information in the markets (bids, asks, and trades) might be used by computerized agents to form beliefs in a way that could produce price paths like those observed in classic double auction experiments. This latter approach of asking how modeling individual agents could lead toward understanding observables such as price paths in markets is the one adopted here. This approach can be used to formulate theory, from which new experiments can be designed (Duffy 2004).

In related literature, Grossman (1976, 1978) and Grossman and Stiglitz (1980) show that equilibrium exists only if there is noise in the price system that prevents traders from inferring perfectly the information from prices. For example, there could be shocks in the supply of the risky asset. They focus on the equilibrium (or disequilibrium) analysis: all traders move simultaneously, and price incorporates all available information instantaneously. There are several significant differences in our approach. First, we model the dynamics of price/bid/ask formation, instead of focusing on the equilibrium results. Second, we use the double auction, instead of the Walrasian auctioneer, because the latter is far removed from the auction structures that are studied in both laboratory and archival studies. Finally, the traders in our model are heterogeneous (in terms of preferences), and there is no shock in the supply of the risky asset. In the Grossman (1976, 1978) and Grossman and Stiglitz (1980) models, there is no trade if everyone knows the revealed information when it is revealed, whereas in our model, risk-sharing will always allow trade to take place.

Marcet and Sargent (1989a, 1989b) study a class of linear stochastic models in which the actual law of motion depends on the agents' perceived law of motion. They show the convergence of recursive least-squares learning schemes to a rational expectations equilibrium. Marcet and Sargent (1989a, 1989b) use a description of how beliefs about the relationship between choices and outcomes arise from repeated processing. Through repeated processing of information and allocations based on that processing, the predicted law of motion becomes the true law of motion. In our model, learning occurs directly. This learning involves examining prices, bids, and asks, and building conditional beliefs that a particular bid or ask will be taken based on a particular mechanism.

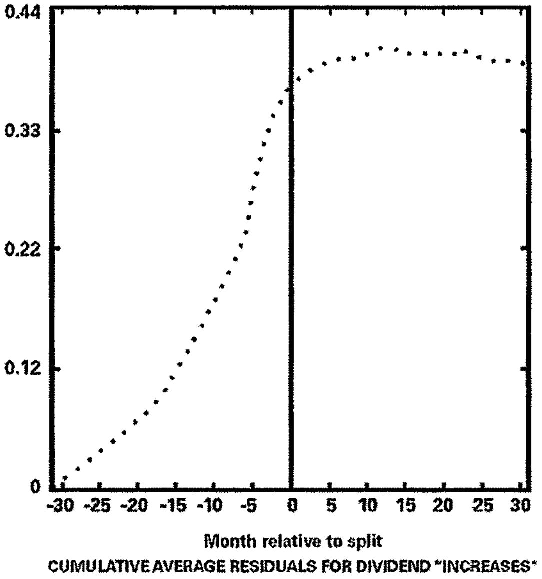
Market agents in Gjerstad and Dickhaut (1998) trade in riskless assets (i.e., assets with a constant payout), yet many archival market studies based on prices from the NYSE are concerned with how risky assets are priced, particularly in response to the arrival of information. Fama (1970) distinguishes between semi-strong and strong form efficiency. Under semi-strong (strong) form efficiency, profitable trades cannot be achieved by individual agents after the release of public (private) information. Such efficiency is often a natural consequence of the behavior of agents whose expectations are rational. When observed in archival data, the returns after information is released are flat, and in numerous instances, it is impossible to build advantageous trading algorithms on such prices. Figure 1, Panel A taken from Fama et al. (1969; hereafter, FFJR), shows the positive change in cumulative residuals (excess returns) for a portfolio of firms up to the point of announcement of a stock split (date 0) with a nearly flat curve thereafter. A stock split is public information such that an interpretation of the residuals before date 0 indicates that their change reflects private information coming into the market, while the behavior of the residuals after time 0 indicates the absence of advantageous trades, thereby implying semi-strong form efficiency.

We show, by adapting the Gjerstad and Dickhaut (1998) trading algorithm to trade in a risky asset, how it is possible to produce prices that are semi-strong efficient but not strong efficient.

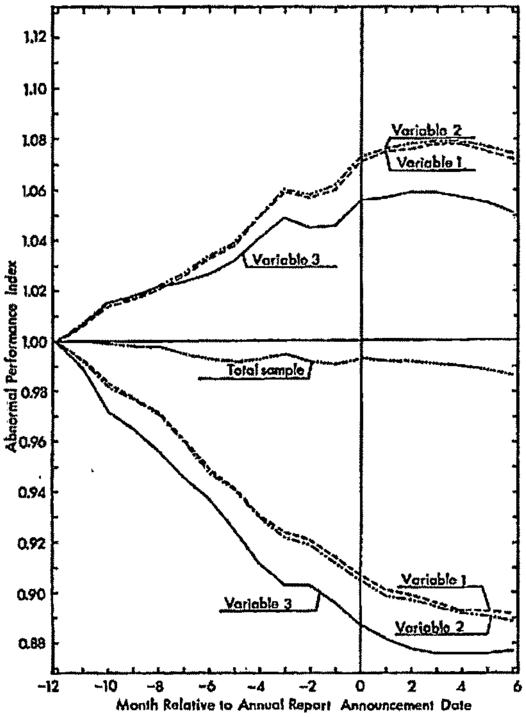
Figure 1, Panel B, taken from Ball and Brown (1968; hereafter, BB), shows the positive (negative) abnormal performance index up to the point of earnings announcements (date 0) for various portfolios of firms and relatively flat curves thereafter. An earnings announcement is public information, and an interpretation of the residuals before date 0 indicates that their change reflects private information coming into the market, while the behavior of the residuals after time 0 is consistent with a notion of a mild drift.

FIGURE 1
Market Efficiency and Drift

Panel A: Semi-Strong Form Market Efficiency (from FFJR [1969])



Panel B: Post-Announcement Drift (from Ball and Brown [1968])



Point 0 is when public information in the form of the earnings announcements arrives for a collection of firms. Each line represents different cumulative average residuals for a collection of forecast/earnings combinations. As is evident in Figure 1, Panel B, the drift after announcement is not independent of the type of information generated. This particular study does not have an explicit theory associated with it that would explain such a drift. We are able to show that this type of drift can be well approximated by the interaction of agents in our model of price formation.

A Brief Description of the Dynamic Process

We describe the economy at an arbitrary point in time, t, in the life of the risky asset. At that point in time, there are a finite number of traders, n. Each trader has an endowment of the risky and a riskless asset. The traders' risk attitudes are all different. Traders may also differ in their information; some traders may be better informed than others. The traders are not assumed to have any direct knowledge of the other types of traders in the environment at any particular point of time.

We model how a sequence of trades comes about in a double auction in which agents post bids and asks. Such bids and asks can start at any amount (here we assume that agents confine their amounts between the high and low payoffs). The critical feature of the auction is that bids and asks are subject to an improvement rule; that is, if there is an outstanding bid and ask at time t, agents may only submit a $t+1$ bid that is higher or a $t+1$ ask that is lower than the outstanding bid or ask. The auction processes only one possible improvement at a time, and a legitimate bid/ask submitted by the first agent will become the new outstanding bid or ask at $t+1$. A trade occurs when a bid equals the outstanding ask, or *vice versa*. If a trade does not occur, all agents must decide what to do at $t+1$ in an attempt to be the outstanding bid/ask at $t+2$.

At any point in time, besides having some information on the payoff of the risky asset, an agent also sees the history of previous bids and asks and how many bids and asks were or were not taken for each ask. There are two types of information processing in which a market participant engages. First, he or she analyzes the implications of his or her own information on the value of a traded asset. Second, he or she analyzes the implications of publicly available prices, bids, and asks to determine his or her action choice in the market. That action can be either making a bid or ask or taking an outstanding bid or ask based on his or her assessment of value. Because agents can have different risk attitudes as well as information, agents can have different valuations of the risky asset. When there are different valuations, there is a potential for an advantageous trade between two agents if the agreed-upon price is between the valuations. An agent need not bid/ask his or her valuation; however, if there is an opportunity to trade at an advantageous price (i.e., buy at a price less than valuation or sell at a price greater than valuation), then the agent will try to take advantage of the opportunity.

When each agent has decided precisely what to do, there will be an expected profit from a potential trade. Traders with higher expected profit from trade are more anxious to act faster.[1] However, another trader may get to the market first. The chance that any particular trader takes his or her action first is a monotonic function of the ratio between his or her expected profit and the sum of all traders' expected profits. Once an action is taken by a trader, the market incorporates that action by either executing a trade or posting a new ask or bid. Then the same process is repeated.

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[1] We use agent (agents), trader (traders), and market participant (participants) interchangeably throughout the paper.

II. DESCRIPTION OF THE MODEL

Figure 2 describes the four basic steps of the model. In step 1, each agent determines his or her value. In step 2, the agent uses market information to assess the likelihood of being able to trade. In step 3, the agent takes an optimal trading action, and step 4 describes the stochastic arrival of agents to the market. We examine each step in detail.

Step 1: Valuation

Each trader comes to the market with a specific risk attitude. Not all traders have the same risk attitude. To make this assumption specific, we describe a risk attitude via a risk parameter later on. However, there is no conceptual restriction on how risk is incorporated. A trader uses the information he or she has to arrive at his or her assessment of the reservation value of the traded asset (i.e., the lowest market price at which the trader would sell and the highest market price at which the trader would buy). The method for making this assessment could involve any type of decision-making model such as expected utility theory, prospect theory, or rank-dependent utility theory.[2] The actor may even choose to include previous market price in the formulation. As long as certainty equivalents can be stated for each probability payoff pair (and wealth combination), the theory works the same way, although the implementation becomes more challenging. Because traders have different risk attitudes, trade is likely to occur.

A market trader may or may not have personal private information. A trader's private information could, in principle, derive from word of mouth or personal observation. Information is not purchased, but rather is simply endowed to traders who are at the right place at the right time. Informed traders do not know how many other traders are informed. All informed traders share the same beliefs about the dollar outcome from the asset when computing their estimates of value. This assumption is implemented by incorporating Bayesian revision relative to the arrival of information.[3] Uninformed traders will have processes for generating beliefs that include all available public information or some portion of it. Uninformed market participants do not know when informed market participants receive information. Because prices, bids, and asks arise from both new information to informed market participants and risk-sharing considerations, uninformed traders are unable to disentangle these effects, thereby basing their assessments of value only on released public information. Accordingly, uninformed market participants are assumed to use Bayesian revision relative only to the arrival of public information.

In step 1, agents are just determining their value before they take an action in the market. We assume that this activity can be done with some degree of precision because

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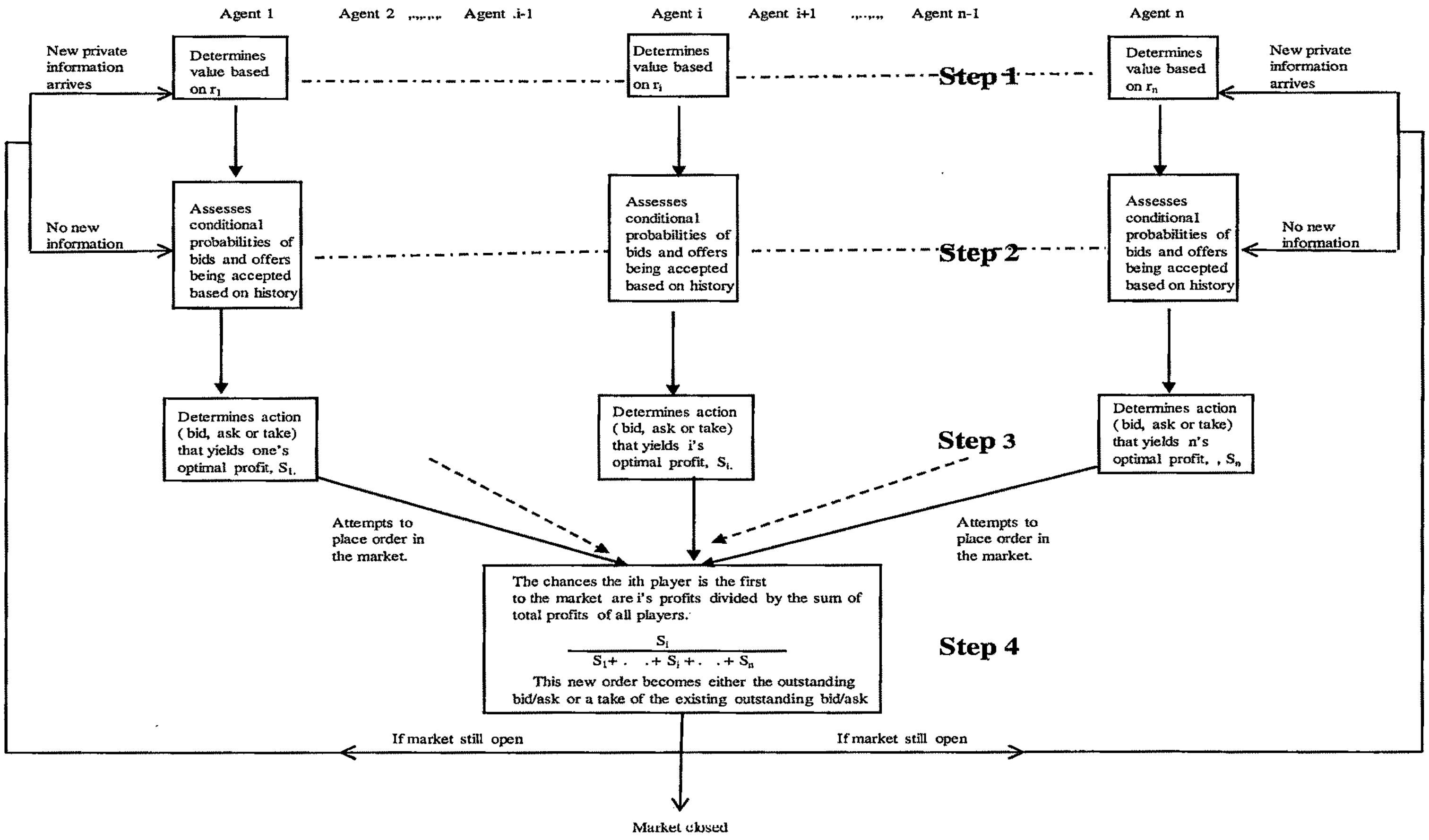
[2] To implement the structure, we will assume that this assessment is made by computing expected utility theory, given available information, and then deriving the related certainty equivalent. We derive here the implications of having ten agents with different risk coefficients who also have the same underlying constant absolute risk aversion (CARA) utility function. The approach can be extended to a general two-state model in which we assume two payoffs and a reservation value. Note that any structure that has a reservation value for the gamble will also work. For simplicity, we employ a model that makes the calculation of the reservation value a direct function of payoffs and risk characterization, although there is no reason to make the model this specific. It is always assumed that the reservation value will be between the high and low payoffs. It may be that the agent has two reservation values, one related to being a seller and the other related to being a buyer. As long as the agent is still interested in the difference between the reservation values and the price received in the market, the structure can work out in the same manner.

[3] Note that pure Bayesian is not absolutely necessary for the general structure of the model. An agent could differentially under-adjust or over-adjust. This characteristic, of course, would need to be built specifically into the adjustment process of the model.

FIGURE 2
The Model


Agent 1
Agent 2 ,.,.,.,
Agent .i-1
Agent i
Agent i+1
.,.,.,
Agent n-1
Agent n
New private information arrives
No new information
Determines value based on r_1
Determines value based on r_i
Determines value based on r_n
Step 1
Assesses conditional probabilities of bids and offers being accepted based on history
Step 2
Determines action (bid, ask or take) that yields one's optimal profit, S_1.
Determines action (bid, ask or take) that yields i's optimal profit, S_i.
Determines action (bid, ask or take) that yields n's optimal profit, , S_n
Step 3
Attempts to place order in the market.
The chances the ith player is the first to the market are i's profits divided by the sum of total profits of all players.
$\frac{S_i}{S_1+.\ .+S_i+.\ .+S_n}$
This new order becomes either the outstanding bid/ask or a take of the existing outstanding bid/ask
Step 4
If market still open
Market closed

experts may be consulted, and there can be extensive representations of whatever information there is. In steps 2 and 3, the agent decides what action to take in the market (i.e., an appropriate bid, an appropriate ask, or a take).

Step 2: Agent Computations of Likelihoods

An agent assesses the conditional probabilities of bids and offers being accepted based on history. In step 2, the agent gathers additional inputs for deciding what action to take in the market (bid, ask, or take of an available bid or ask outstanding). The agent uses the certainty equivalent of his or her computed value from the previous step as well as the available market information (prices, bids, and asks). At any point in time t, there is a set of messages. Each of these messages is sent in the form of a bid, ask, taken bid, or taken ask by a specific agent. The message at time t reflects an action by one of the agents in the economy that maximizes that agent's expected surplus.[4]

The additional information the agent computes in this step is the likelihood that a particular bid or ask will be taken by someone else in the market. In the absence of differential information, traders still do not know what types are in the market, and so engage in trades based only on available bid, ask, and trade information, identifying pseudo-arbitrage opportunities based on that information and private knowledge of risk. This preference process is stimulated by the ability to re-trade. While pseudo-arbitraging is taking place, differential information can arrive to traders. Traders with new information revalue; people without do not revalue. Traders do not know anyone else received new information and what that information might be. They infer from price the advantageous trade relative to that price. We assume that agents have limited memory.

While a trader knows his or her value of the asset, he or she knows nothing about the risk distribution of other trader types, nor how the most recent market observations reflect the consequence of differential information or risk-sharing. Thus, every trader bases his or her assessment on the likelihood of a particular bid (ask) being accepted on recent observed information in the market about whether that bid (ask) will be successful or unsuccessful. We assume, because the trader simply has such limited information and no basis for assigning priors, that the only information on which the trader can base his or her action regarding a bid or ask is the recent prices, bids, and asks. He or she then resorts to a simple counting system (which can be subconscious). For example, the likelihood that a specific dollar bid B will be taken is based on (1) the number of times this specific dollar bid has been successfully taken, $\#BT$; (2) the number of times an ask below this bid has been made, $\#(A < B)$; and (3) the number of times a bid above this bid has not been taken, $\#(BNT \geq B)$. The likelihood is then computed using the following formulation:

$$\frac{\#BT + \#(A < B)}{\#BT + \#(A < B) + \#(BNT \geq B)}.$$

A similar counting algorithm applies to the calculation of the likelihood of being taken for a specific dollar ask A:

$$\frac{\#AT + \#(B > A)}{\#AT + \#(B > A) + \#(ANT \leq A)},$$

---

[4] The timing of messages is independent of the type of risk preferences the agent has for representing the basic gamble as well as the belief revision policy.

where $\#AT$ is the number of times this specific dollar ask has been successfully taken; $\#(B > A)$ is the number of times a bid above this ask has been made; and $\#(ANT \leq A)$ is the number of times an ask below this ask has not been taken.

Why does a trader form such a belief? Given the paucity of information in the environment, we suggest that the traders resort to primitive mechanisms that have evolved through millions of years. In referring to primitive mechanisms, we refer not only to human evidence, but also to evidence that has been more precisely gathered with animals other than humans. There are now findings that the brain has the ability to represent numbers as if taken from a line segment, and that this ability has existed somewhat indefinitely. For example, rats are capable of distinguishing the numbers 1, 2, 3, and so on, based on whether a reward is given when a rat presses a lever exactly one, two, or three times. Monkeys can also do simple auxiliary mathematical operations such as addition. This behavior occurs conjointly with activation in the posterior parietal sulcus and dorsolateral prefrontal cortex of the monkey brain. Humans have a very extensive system for representing numbers inexactly in the horizontal intraparietal sulcus and have mechanisms for adding, subtracting, multiplying, and dividing. These operations can be carried on by the brain regardless of whether an individual is conscious of performing these operations. Recently, Fiorillo et al. (2003) found evidence that specific cells of the monkey can be tuned to different conditional probabilities of reward that exist in the environment. Thus, we are not assuming conscious mechanisms in the mind of the trader, but rather that traders have a feel for what is the best bid or ask, even though they may not be aware how such feelings arise. Gigerenzer and Ulrich (1995) trained experimental participants to behave in a Bayesian fashion based on variations in the types of counting systems used here, although they assume more explicit information.

An alternative way to think about this is to equate the individuals in the economy to econometricians in the sense of Sargent (1993, 3–4). The critical point we are trying to make here is that even without being aware of any explicit statistical expertise, our agents have ways of examining conditional probabilities, which would be at the heart of any econometric formulation.

Step 3: Determination of Optimal Action

In step 3, the agent determines the expected monetary profit for each action he or she might take.[5] The expected profit for particular agent i, with a valuation V_i, for bid B, will be $P(B)(V_i - B)$, where for an observed B:

$$P(B) = \frac{\#BT + \#(A < B)}{\#BT + \#(A < B) + \#(BNT \geq B)},$$

while for previously unobserved Bs, the calculation for $P(B)$ is determined by interpolation. The resulting $P(B)$ is nondecreasing in B.

Similarly, the expected profits for particular agent i, with a valuation V_i, for bid A, will be $P(A)(A - V_i)$, where for an observed A:

---

[5] We omit here the construction that would be necessary if the agent had a different certainty equivalent for buying and selling.

$$P(A) = \frac{\#AT + \#(B > A)}{\#AT + \#(B > A) + \#(ANT \leq A)},$$

while for previously unobserved As, the calculation for $P(A)$ is determined by interpolation. The resulting $P(A)$ is non-increasing in A.

Choice calculation proceeds as follows: the agent behaves as if doing four calculations:

$$\operatorname*{Max}_{B} P(B)(V_i - B),$$

$$\operatorname*{Max}_{A} P(A)(A - V_i),$$

$$V_i - OB,$$

$$OA - V_i,$$

where OB (OA) is the existing outstanding bid (ask). Determining the maximum profit from these calculations leads to the selection of an action that will be a particular B, A, OB, or OA, where the maximum profit is greater than 0. Each subject can make a bid, make an ask, or take an outstanding bid or ask. Thus, he or she may be a buyer or a seller.

Step 4: Whose Bid/Ask Is Posted First—A Decentralized Process

To summarize, through the first three steps, each trader arrives at what he or she would do if the trader could act first in the auction; that is, he or she knows whether to (1) make a bid, (2) make an ask, (3) accept an outstanding bid, or (4) accept an outstanding ask. A player will only take one of these four actions. The expected profit for each action is computed in choice calculation.

The auction mechanism acknowledges only one action of only one player. Once this action is incorporated into the message structure of the auction, all players are notified, and the bidding process begins again. What is important is the determinate of who moves in the auction and that we are not assuming the mechanism makes the decision of who moves first.

It is crucial that the auction be decentralized if prices are a consequence of individual choice. This means that we need a behavioral theory of how such decentralization takes place. No single person (or mechanism) knows all profits or valuations of each actor. We assume that on average, the more profit a single player makes, the more likely he or she will enter the auction; that is, higher profits to a player induce that player to act faster. Interpreting this proposition strictly would imply that the person with the highest expected profit would always move first. However, we assume some noise in the response, which could be attributed to the circumstances of individual players. This assumption is captured in the following way: if S_i is the expected profit of the optimal action for the ith player, then the likelihood that player i will move first is:

$$\frac{S_i}{S_1 + \cdots + S_i + \cdots + S_n}.$$

Any monotonic function defined on the S_i will result in a similar construction that will generate noise in trades. The important point here is that if traders move to get in the auction based on their profits, then the entire process is decentralized.[6]

The assumption that speed of reaction depends on payoffs is well established in many studies. A general theory of reaction times is that an alternative with higher profits results in arriving at a decision faster when compared with a zero-profit alternative (doing nothing). Such an approach can be incorporated into an established theory of reaction time. For example, Dickhaut et al. (2008) use Ratcliff's (1978) theory to show that the further away a choice is from zero profits as compared to an alternative, the faster is the reaction time. Furthermore, the notion that higher rewards stimulate faster reaction times has strong support with respect to primitive brain development. Tremblay and Schultz (1999) find that specific neurons in the orbital frontal cortex respond not only when a reward is received, but respond faster the higher the reward. The latter evidence suggests that the speed of response can be determined without conscious awareness.

Our mathematical formulation of the theory is in the Appendix.

III. RESULTS FROM COMPUTATIONAL ECONOMIES

Agent-Based Computational Models

Our results are computer computations that result from studying the behavior of agents through repeated interactions in our markets. Each agent acts separately and independently (except through market information) of other agents. This approach goes by the name *agent-based modeling* and is a particular form of simulation that has grown increasingly popular for studying emergent phenomena, that is, phenomena that, in the aggregate, arise from the interaction of individuals who have no understanding of their impact on aggregate phenomena (Bonabeau 2002). Thus, we are showing how the market prices that arise when different market phenomena are observed, are a consequence of agents with the same underlying characteristics. Only aspects of the market setting have changed. The program was written in Mathematica and is available on request from the authors.

Characteristics of All Economies

In the computational economies discussed in this section, we follow the general hypothesis arising from experimental economics that properties of large-scale economies can be approximated with a small number of agents in the double auction (Smith 1962). For our graphical results, we always use either 10 agents or 20 agents. Each agent is endowed with the same number of risky and riskless assets. In the specific economies, agents have different risk coefficients, but across economies, the collection of risk coefficients is held constant.

Possible states and signals are always the same, and priors are held the same on all states in the first two economies. There are two possible public information signals in economies 1 and 2, and the realization of public information is the same across economies. In our economies, the public signal takes on a value of 40. Furthermore, the conditional probabilities of public signal given the state are always the same. These features of the economies are characterized in Table 1, Panels A and B.

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[6] Each subject can make a bid, make an ask, or take an outstanding bid or ask. Thus, he or she may be a buyer or a seller. Agents learn the consequences of their actions and remember them for four trades.

TABLE 1
Distributions of States, Signals, and Forecasts

Panel A: State Characteristics

Possible States	40	80
Prior Probabilities of States	0.2	0.8

Panel B: Conditional Probabilities of Public Signal Given States

	State = 40	State = 80
Public Signal = 40	0.8	0.2
Public Signal = 80	0.2	0.8

Panel C: Conditional Probabilities of Private Signal Given States

	State = 40	State = 80
Private Signal = 40	0.8	0.2
Private Signal = 80	0.2	0.8

Panel D: Conditional Probabilities of Public Signal Given State and Private Signal

	Private Signal = 40	Private Signal = 80
State = 40		
Public Signal = 40	0.9	0.7
Public Signal = 80	0.1	0.3
State = 80		
Public Signal = 40	0.3	0.1
Public Signal = 80	0.7	0.9

Computational Economy 1: Strong versus Semi-Strong Form Market Efficiency (Approximating FFJR)

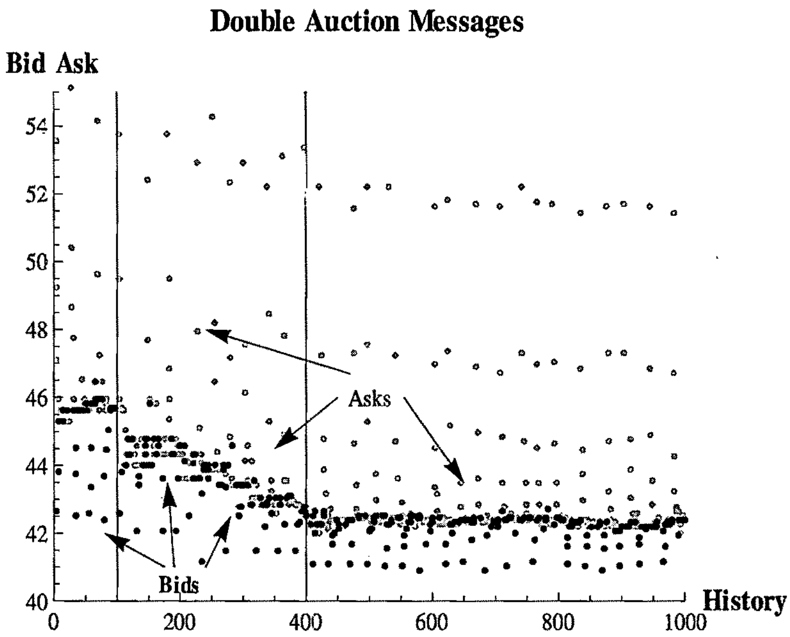
The first study shows that, with public information, semi-strong form efficiency arises without strong form efficiency. There are 1,000 points of history that are potential trading dates. At any of these points in history, an outstanding bid and/or ask as well as the previous history exists. The trader may have private or public information at any point. Different traders receive the same piece of private information at time 100 (two agents get information); at time 200 (three different agents get information); and at time 300 (three more agents get information). The exact same piece of information is made public at time 400.

Each agent can determine a different certainty equivalent relative to his or her information and risk attitude (see "Step 1: Valuation"). When informed agents receive a signal, they update their probabilities of the state outcome of 40 or 80 dollars accordingly. For the economies studied here, the private signal takes on a value of 40, and the appropriate conditional probabilities of private signal given the state are represented in Table 1, Panel C. The information structure, timeline, and belief updating are summarized in scenario 1 of the model in the Appendix.

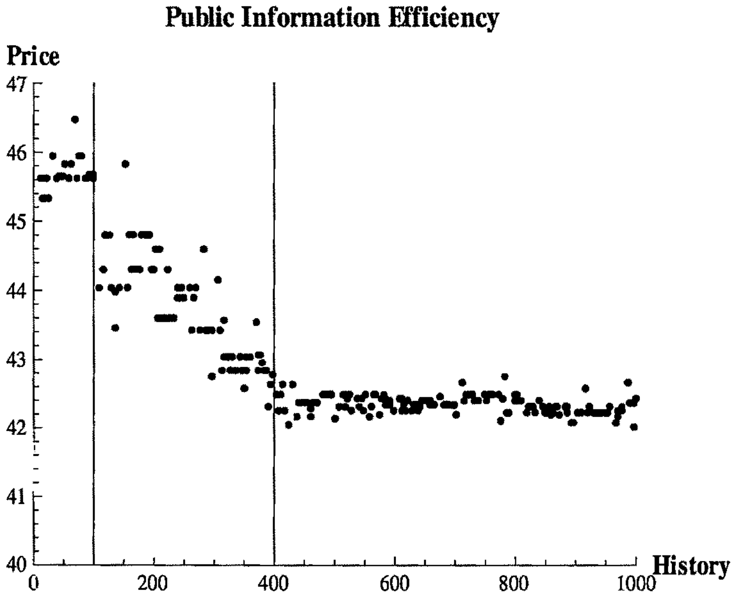
A market agent would like to sell above/buy below his or her certainty equivalent. If a trader were at point in time 200, he or she would see all the information portrayed in Figure 3 prior to point 200. A trader also knows which bids and asks were successful in leading to an exchange, so he or she can see for a particular bid just how frequently it was chosen. The trader knows nothing about other traders in the market such as whether, at any point in time, other traders have received private information. The limited trader

FIGURE 3
Messages from Computational Economy 1

Panel A: Double Auction Messages (Bids and Asks)



Panel B: Pricing Messages



information about whether particular bids or asks were taken gives the trader some insight (although the lack of specificity of the problem makes this insight non-Bayesian) and an ability to calculate relative frequencies in an as-if manner.[7]

Each trader is guided by maximum profit in the trading market relative to the certainty equivalent. In period 0 to 100, all traders, though not consciously aware, have the same identical information for determining their values. In this case, priors are 0.2 and 0.8 on the states 40 and 80, respectively, which are final payoffs. Note that prices need not be constant because trades at a new price for one trader *can change the expected gains to trade* for an action (bid, ask, or take) of the other traders.

Computational Economy 1: Bid/Ask Results

In Figure 3, Panel A, the gray points are simulated asks and the black points are simulated bids. There is a tendency toward scalloping (i.e., a downward string of asks or an upward string of bids) in the data, particularly in the early stages. This scalloping most often represents a single agent who tries to make an advantageous trade and then is disciplined by the market in the sense that the market will not jump at the over- (under-) priced ask (bid). A participant represented by a scallop has a much higher expected profit from his or her action than other traders have from their actions, leading that participant to try to take advantage of the profit opportunities. The improvement rule forces a potential seller (or buyer) to reduce asks (or increase bids) until a trade is made. A particular seller keeps lowering his or her ask until his or her profits are more in line with those of other traders in the market. As more traders enter, we see competition in bidding behavior. After a trade, the outstanding bid and ask are reset, and we can see scalloping again. Bids and asks become more and more concentrated because the agents most frequently tend to use asks and bids that have had some degree of success in generating exchanges in the past. In this setting, sellers appear to undercut each other, but in a formal sense, they are not strategic insofar as their actions do not anticipate other traders' responses. Sellers simply identify optimal asking prices based on the information that is available in the market, that is, bids, asks, and takes. This competition is not arising from considering what other agents might be thinking, but rather, it is a form of arbitrage relative to market bids and asks.

In this scenario, the market is always discovering information in a Hayekian sense (Hayek 1948); that is, an order is emerging in the market in a way that none of the participants anticipate, such that the distribution of bids and asks is an unintended consequence of all the actors in the economy.

Computational Economy 1: Pricing Results

Figure 3, Panel B displays the time-series for price in this economy. Trades are represented by points on the graph. Trades in the interval 0 to 100 reflect gains to risk-sharing. At point in time 100, the private signal begins to be absorbed in market price, and we see price gradually shifting downward as more and more traders learn the private message. At point in time 400, public information is released and prices settle down to a steady state, but prices continue to vary because any trade can affect the profit opportunities of others. Up until time 400, it is possible to see private information leaking into prices. During this time, there are always two sources of uncertainty when trading: the potential existence of private information and uncertainty about whether a particular action will lead to a consummated transaction.

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[7] The exact description of traders in this economy is given in the Appendix. While we used a specific form of the utility function here, the theory is not at all constrained to this function, or to expected utility maximization, for determining the certainty equivalent of a share.

We interpret these results as being consistent with semi-strong form efficiency but not strong form efficiency. The graph has a qualitative similarity with the earlier graph for FFJR. To get a better feel for this result, we bootstrapped this procedure 100 times, yielding a distribution of regression coefficients of prices on time. We compare the resulting diagrams, together with the BB computational economy described in the next section.

Computational Economy 2 (Approximating BB)

To approximate the BB results, we keep the scenario the same as the FFJR case but assume that private and public information are not equivalent. The public signal is correlated, but not perfectly, with the private signal. There are, again, 1,000 points of history that are potential trading dates. At any of these points, an outstanding bid, ask, or exchange may occur. Private and public information arrive identically to economy 1. The bid/ask data for the correlated setting have the same general properties as the complete revelation setting, although offers are disregarded a bit more as time increases after the public information announcement.

The information structure, timeline, and belief updating are summarized in scenario 2 in the model in the Appendix. For this economy (and economy 3, later), the appropriate additional conditional probabilities are represented in Table 1, Panel D.

The double auction price data are captured in Figure 4, Panel A. There is an apparent drift in these data. As in computational economy 1, we also bootstrapped this procedure 100 times, yielding a distribution of regression coefficients of prices on time. The distributions of coefficients of time-series for economies 1 and 2 are displayed in Figure 5.

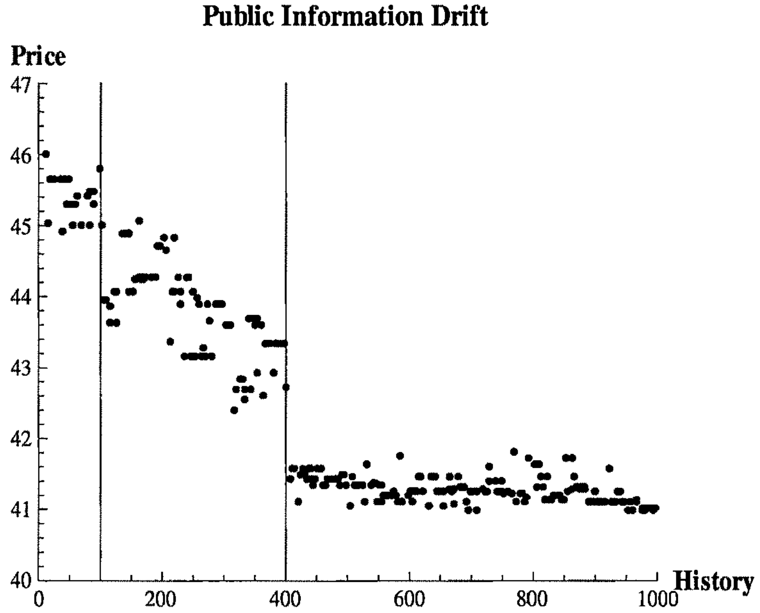
The top graphs show the coefficients corresponding to the private information times (100 to 399) and public information times (400 to 1,000) of the FFJR agent-based simulation (economy 1). Note that the distribution of coefficients is significantly shifted to the left in the private information case and is consistent with the period 100 to 399 in the single economy of Figure 3. The coefficients in FFJR/public correspond to 100 runs of periods 400 to 1,000. The coefficients, while slightly shifted to the left, are indistinguishable from 0. The bottom graphs show the BB private and public information (economy 2). Since both private information graphs for FFJR and BB are drawn on the same scale, it is apparent that prior to public information, the distribution of coefficients is virtually identical. On the other hand, after release of public information, the distribution of coefficients under BB is further skewed to the left and is significantly different from that under FFJR (with $p < 0.001$ using a Kolmogorov-Smirnov test).

To examine for similarities between our agent-based simulations and experimental work, in which data can be used to indicate differential information under asymmetric versus public state uncertainty, we also compared an estimate of the autocorrelation process using generalized autoregressive conditional heteroscedasticity (GARCH; Bollerslev 1986) techniques. By expanding the number of agents in the economy to 50, we can show that when asymmetric information is present, prices follow a GARCH (2,1) process. Concurrently, when all information is public, a GARCH process cannot be detected. These results are consistent with those documented in experimental data (e.g., Bruguier et al. 2008).

We also compared the allocative efficiency of prices in a setting with public information to a setting with private information. When economies are constrained to have the same length (1,000 points of time) as well as the same endowments and risk characteristics as in our BB and FFJR examples, allocative efficiency in the private setting is 55 percent,

FIGURE 4
Messages from Computational Economies 2 and 3

Panel A: Price Messages from Computational Economy 2



Panel B: Price Messages Showing Volatility from Economy 3

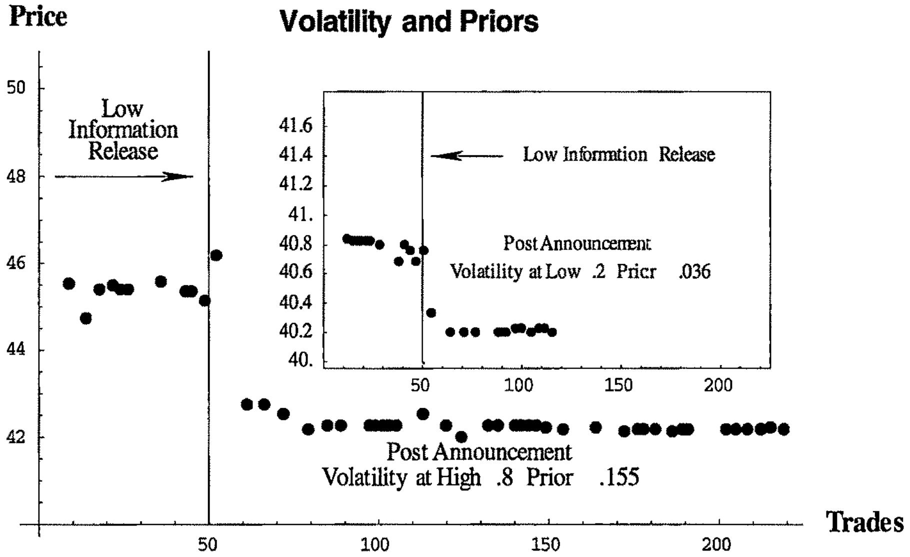
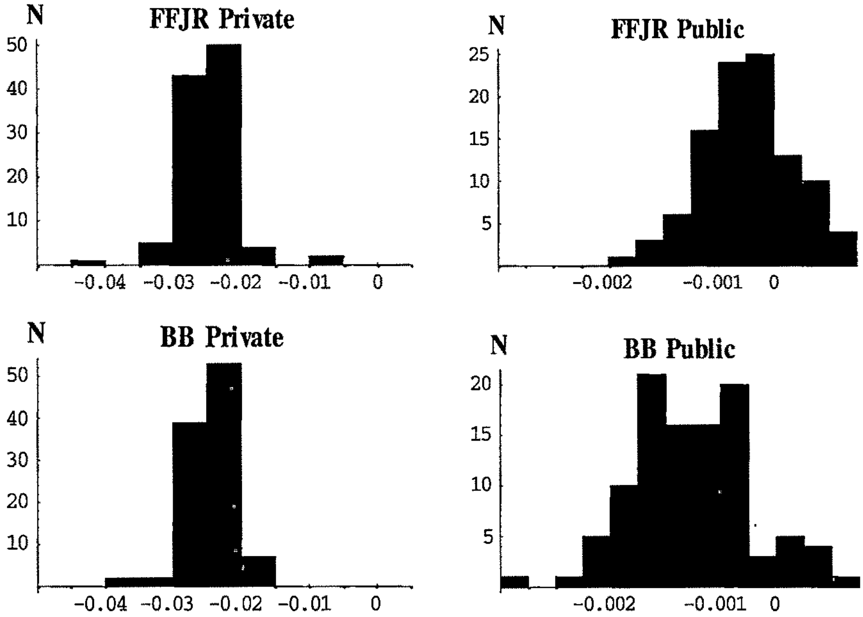


FIGURE 5
Distributions of the Regression Coefficients of Prices against Time



while in the public state information setting, the allocative efficiency is 99.5 percent. For a discussion of this computation, see Plott and Sunder (1982).

Computational Economy 3: Volatility

The literature contains numerous results regarding volatility. We focus on a volatility result for which there is theoretical basis. Veronesi (1999) proposes that volatility in response to information regarding a particular event is conditional on the priors of that event. In particular, given the same information event, the market with the higher prior probability will have more volatility in the market price when the same information is revealed. In the Veronesi model, prices move from one equilibrium level to another. There is no mechanism by which individual agents formally enter into the price-setting process through making bids or asks. In our model, it is possible to produce Veronesi's volatility result when traders are actively engaged in trading in an auction; we can then show how differences in measured volatility arise as a consequence of differences in prior probabilities.

Figure 4, Panel B portrays the outcome of applying our price formation mechanism under Veronesi's (1999) assumptions. In one economy, agents begin with high priors (0.8) of the high state outcome (80), while in the other economy, agents begin with low priors (0.2) of the high state occurring. The remaining aspects of these two economies are identical and reflected in Table 1, Panels A and B. We assume that a public low signal (40) is received at trading point 50 in each setting. The interior graph plots price on the vertical axis and history of trades on the horizontal axis when all agents have a prior of 0.2 and receive a public signal of 40. When everyone receives identical information, the price adjustment is very quick, even though individual agents are trading only on their private accounts and do not assess a distribution of future prices. Note that there is some variability after the adjustment occurs. In the interior graph, the ticks on the vertical axis increase at a rate of 0.2, which suggests that volatility is low. If we measure volatility as the standard deviation of price after the release of the information, it is 0.036. On the other hand, the description of a market reaction when there are high priors is portrayed in the outer graph, which shows that agents trade on their own accounts and prices adjust quickly. Once again, there is no anticipation by agents of what other agents will do, and in this sense, they do not behave strategically. The range of the outer graph is 40 to 50, which seems to suggest that the volatility for prices after receiving information is greater than when the priors are 0.2. Volatility as measured by standard deviation of prices after the information release is now 0.155, so the Veronesi (1999) claim is reflected in these data.

Robustness

There are a number of ways to examine the robustness of our price formation dynamic. One is to simply replicate the same economy for a large number of trials. We used this approach for describing the initial studies of semi-strong form efficiency and failure of semi-strong form efficiency, finding consistent results with a reasonable tolerance level (see Figure 5). In addition, we varied the specifications of the utility functions, the endowments of agents, and the initial probabilities of agents with consistent findings across all cases.

We consider the strongest strength of the model the fact that, not only the results on efficiency, but in addition, other fundamental results emerge, including the information transmission in forecasts, volatility of prices in settings with and without asymmetric information, bid-ask spreads in relations to asymmetric information, and the possibility of drift processes induced by non-standard belief revision. This extended set of results, along with the discussion of other auction mechanisms (e.g., dealers) that could yield similar conclusions, are in a companion piece "Learning about Field Behavior Using a Laboratory-Based Model" (Dickhaut and Xin 2009).

IV. CONCLUSIONS

This study builds a model of price formation and shows that the model leads to a variety of phenomena, including semi-strong from market efficiency, semi-strong market inefficiency, and predictable volatility. Rather than specify just prices, the model specifies the generation of all messages as they reach the market. Our model yields the ability to test parametric predictions of the theory in a variety of experimental settings in which tastes can be estimated or induced. O'Brien's (1992) and Dickhaut et al.'s (1993) results from inducing preferences in auctions suggest the plausibility of tracking the predictions of such a model. O'Brien (1992) does not explicitly attempt to specify the evolution of all messages in the market. Recently, Gjerstad (2006), in a non-risky setting, has been able to explicitly test the predictions of this price formation process when individuals' values are certain and there is no asymmetric state information.[8]

To elaborate the test of our model, suppose one takes the model predictions in computational economy 1. That economy yields bid/ask spreads, prices, volatility, and a lagged correlational structure. These predictions can be tested with an experiment that induces the risk preferences used in that computational economy, randomly releases private information, and has a public information release in a double auction (e.g., using the methodology of Plott and Sunder [1982]).

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[8] There could, of course, be other models. The model of Bosch-Domenech and Sunder (2000) is a model of price formation that does not achieve the specifics of the current setup, but conceivably, a variant of this approach might be made to create the pricing information described here.

Beyond predicting in the laboratory, we explore fundamental findings from empirical-archival accounting and finance. Notions of weak and strong form market efficiency have been replicated extensively in archival settings (Fama 1970, 1991). Our contribution is to provide a theory derived from laboratory experimentation that can explain such results and provide conditions under which they might occur. Unlike standard accounting and finance theory, we incorporate the choices of individual traders involving how to submit bids and asks and take outstanding bids and asks.

APPENDIX
THE MODEL

Environment at Time *t*

Preferences and Valuations

The model can be applied to an arbitrarily large finite set of states and signals. For concreteness, we focus on a world with two states and two possible signals each time information is released. We assume an economy with n agents, all of whom will consume at a future time T. There are two types of assets: riskless and risky. At T, the risky asset pays off one of two amounts of the riskless asset, $\{x_L, x_H\}$, where $x_H > x_L$. At any time t, agent i holds a belief $P_{H,i,t}$ ($0 \leq P_{H,i,t} \leq 1$) regarding the probability of the high outcome. We assume that each agent i has a constant absolute risk-averse utility function defined relative to the holdings of the riskless asset at time T:[9]

$$U_i(w_i) = -e^{-\lambda_i w_i},$$

where w_i denotes i's wealth at T and $0 \leq \lambda_i < \infty$ is agent i's risk parameter. Given λ_i, $P_{H,i,t}$, and $\{x_L, x_H\}$, the expected utility of the risky asset to i at t will be:

$$EU_i(\lambda_i, P_{H,i,t}, \{x_L, x_H\}) = (1 - P_{H,i,t}) \cdot (-e^{-\lambda_i x_L}) + P_{H,i,t} \cdot (-e^{-\lambda_i x_H}).$$

The valuation of the gamble in units of the riskless asset is that value of $c_{i,t}$ that solves:

$$-e^{-\lambda_i c_{i,t}} = (1 - P_{H,i,t}) \cdot (-e^{-\lambda_i x_L}) + P_{H,i,t} \cdot (-e^{-\lambda_i x_H}),$$

where $c_{i,t}$ represents that amount at which agent i is just willing to buy or sell at time t.

In the preceding setting, the agents may or may not have homogeneous beliefs. Later, we consider settings in which the market might not fully incorporate information. Furthermore, t is meant to be any arbitrary t less than T, thus t might be the initial time ($t = 0$), or it may represent the time at which private or public information is received, or the time of a forecast.

Information Structures

We focus on two prototypical information scenarios. In both scenarios, all agents start out with the same prior beliefs. Privileged agents receive private information, and later public information is released. These scenarios are captured by Figure A1.

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[9] Any structure that can define certainty equivalents for each probability payoff pair (and endowment) will also work here (e.g., prospect theory).

FIGURE A1
Timeline of Information Scenarios

Period Begins	*Private Information Received*	*Receipt of Public Information*
$t = 0$	$t = t_{\text{private}}$	$t = t_{\text{public}}$

In each setting, there are initial prior beliefs for the low and high states represented by:

$$S = \begin{pmatrix} P_L \\ P_H \end{pmatrix}.$$

At time t_{private}, selected agents are informed of a private signal, which can take on the value L or H. The likelihoods of the private signal given low and high states are given:

$$SM1 = \begin{pmatrix} P_{L\backslash L} & P_{H\backslash L} \\ P_{L\backslash H} & P_{H\backslash H} \end{pmatrix},$$

where $P_{i|j}$ is the conditional probability of message i given state j.

The scenarios differ at time t_{public}. In scenario 1, the public information is identical to the private, and so the likelihood of the public signal given the private signal is simply equivalent to the private signal given the state. In scenario 2, the public signal is a separate random draw, and thus the public information is only partially correlated with the private information. An appropriate probabilistic representation of these facts is:

$$SM2M1_L = \begin{pmatrix} P_{L\backslash L,L} & P_{L\backslash H,L} \\ P_{H\backslash L,L} & P_{H\backslash H,L} \end{pmatrix} SM2M1_H = \begin{pmatrix} P_{L\backslash L,H} & P_{L\backslash H,H} \\ P_{H\backslash L,H} & P_{H\backslash H,H} \end{pmatrix},$$

where $P_{i|j,k}$ represents the probability that the public signal is i given that the private signal is j and the state is k.

In this construction, we assume that agents, after seeing information, perform Bayesian revisions to arrive at revised probabilities. Thus, in scenario 1, an agent would calculate the probability of the *high* state given *low* private and public messages as $SM1_{2,1} \cdot S_2/(SM1_{2,1} \cdot S_2 + SM1_{1,1} \cdot S_1)$.

On the other hand, in scenario 2, the agent calculates the probability of the *high* state given *low* private and public messages based on the dependency between the messages as $(SM2M1_H)_{1,1} \cdot SM1_{2,1} \cdot S_2/[(SM2M1_H)_{1,1} \cdot SM1_{2,1} \cdot S_2 + (SM2M1_L)_{1,1} \cdot SM1_{1,1} \cdot S_1]$.

These information structures are reflected in Table A1.

Institution: The Double Auction

In the double auction, potential sellers post asks and potential buyers post bids. The message space defines a set of allowable messages for each agent. We consider the double

TABLE A1
Information Structures in the Computational Economies

	Initial Beliefs	Private Information	Public Information Fully Redundant with Private Information
Scenario 1	$S = \begin{pmatrix} P_L \\ P_H \end{pmatrix}$	$SM1 = \begin{pmatrix} P_{L\backslash L} & P_{H\backslash L} \\ P_{L\backslash H} & P_{H\backslash H} \end{pmatrix}$	$SM2M1 = SM1 = \begin{pmatrix} P_{L\backslash L} & P_{H\backslash L} \\ P_{L\backslash H} & P_{H\backslash H} \end{pmatrix}$
	Initial Beliefs	**Private Information**	**Public Information Partially Correlated with Private Information**
Scenario 2	$S = \begin{pmatrix} P_L \\ P_H \end{pmatrix}$	$SM1 = \begin{pmatrix} P_{L\backslash L} & P_{H\backslash L} \\ P_{L\backslash H} & P_{H\backslash H} \end{pmatrix}$	$SM2M1_L = \begin{pmatrix} P_{L\backslash L,L} & P_{L\backslash H,L} \\ P_{H\backslash L,L} & P_{H\backslash H,L} \end{pmatrix},$ $SM2M1_H = \begin{pmatrix} P_{L\backslash L,H} & P_{L\backslash H,H} \\ P_{H\backslash L,H} & P_{H\backslash H,H} \end{pmatrix}$

$P_{i|j}$ is the conditional probability of message i given state j.
$P_{i|j,k}$ is the probability that the public signal is i given that the private signal is j and the state is k.

auction with a bid/ask spread reduction rule (defined later). In effect, this produces restrictions on any agent's messages as a function of previous messages from all agents. The double auction imposes no restrictions on the sequencing of messages: any agent can send a message at any time during the trading period. Allocation of units is by mutual consent between any buyer and seller. If a seller's ask is acceptable to a buyer, then a transaction is completed when the buyer takes (accepts) the seller's ask. Similarly, a buyer's bid may be accepted by a seller.

Definition 1: *Asks.* An ask a is an amount that a potential seller i is willing to accept from any buyer as payment for a unit of the commodity being traded. To submit an ask of a, seller i sends the message $(i, 0, a)$.

Definition 2: *Bids.* A bid b by a potential buyer j is an amount that j is willing to pay to any seller for a unit. Buyer j submits this bid by sending the message $(0, j, b)$.

Definition 3: *Spread Reduction Rule.* The lowest ask in the market at any time is called the *outstanding ask* and is denoted oa. At any time, agents must place asks a satisfying $a < oa$. The highest bid is called the *outstanding bid*, denoted ob. If agents place a bid, then it must be above the outstanding bid. The outstanding ask oa and outstanding bid ob define the bid/ask spread $[ob, oa]$. In markets with a spread reduction rule, all bids and asks fall within the bid/ask spread.

Definition 4: *Acceptance.* If a potential seller i sends the message $(i, 0, a)$, and holds the outstanding ask $oa = a$, then a take of oa by a buyer j is an agreement by j to purchase a unit from seller i at the transaction price $p = oa$. Buyer

j accepts the outstanding ask oa by sending the message $(0, j, b)$, where $b = oa$. Similarly, if the outstanding bid ob is held by buyer j', then a take of ob by seller i' is an agreement by i' to sell a unit to buyer j' at the transaction price $p = ob$.

Definition 5: Trades. A trade is represented by (i, j, oa) if j takes the ask of i or (i', j', ob) if i' takes the bid of j'.

Observed Histories

This section demonstrates a method of describing data to arrive at what needs to get into the calculation of probabilities. A record of bids, asks, and takes constitutes a history of transactions. For example, consider the following history:

$$H_2 = \{h_1, h_2\} = \{(3, 0, 45.00), (3, 1, 45.00)\}.$$

This history captures the fact that agent 3 submitted an ask of 45.00 and agent 1 accepted that ask.

Definition 6: Histories. After n messages have been sent, there is a history H_n of n ordered triples. For any message $m_{n+1} = (m_{n+1,1}, m_{n+1,2}, m_{n+1,3})$ that is sent, one of six cases will hold:

Invalid ask or bid. A message $m_{n+1} = (i, 0, a)$ is not valid if $a \geq oa$. An invalid ask will not be included in the history. In effect, the institution ignores messages that violate the spread reduction rule. Similarly, a message $m_{n+1} = (0, j, b)$ is not valid if $b \leq ob$.

No ask outstanding. If no ask has been made since the last transaction, then there is no outstanding ask, and any ask a is valid. If, in addition, $m_{n+1,3} > ob$, then $h_{n+1} = m_{n+1}$.

No bid outstanding. Similarly, if no bid has been made since the last transaction, then there is no outstanding bid, and any bid b is valid. If $m_{n+1,3} < oa$, then $h_{n+1} = m_{n+1}$.

Acceptance of ob. If $m_{n+1,1} \neq 0$ and $m_{n+1,3} = ob$, then seller $m_{n+1,1}$ is making an offer at ob, so that m_{n+1} is an acceptance of ob. The buyer's identity is found by looking back in H_n and finding the last h_k with $h_{k,2} \neq 0$ that is, $k^* = \max\{k: h_{k,2} \neq 0\}$. Then $(h_{n+1,1}, h_{n+1,2}, h_{n+1,3}) = (m_{n+1,1}, h_{k^*,2}, ob)$.

Acceptance of oa. If $m_{n+1,2} \neq 0$ and $m_{n+1,3} = oa$, then buyer $m_{n+1,2}$ is making a bid at oa, so the m_{n+1} is an acceptance of oa. The seller's identity is found by looking back in H_n and finding $k^* = \max\{k: h_{k,1} \neq 0\}$. Then $(h_{n+1,1}, h_{n+1,2}, h_{n+1,3}) = (h_{k^*,1}, m_{n+1,2}, oa)$.

Improving ask or bid. If $m_{n+1,3} \in (ob, oa)$, then m_{n+1} is either an improving ask or an improving bid, and $h_{n+1} = m_{n+1}$.

Behavior

At any point in time, agent i has a valuation for the risky asset $c_{i,t}$, which represents the price at which the agent would either buy or sell.

Definition 7: Trading Profits. Given a trade $(i, j, h_{n+1,3})$, in which i sells j a unit of the risky asset with given valuations $c_{j,t}$ and $c_{i,t}$, then the trading profits to the seller and buyer are $(h_{n+1,3} - c_{i,t})$ and $(c_{j,t} - h_{n+1,3})$, respectively.

After observing the most recent message m_n, each agent decides whether to submit a bid or ask and the amount of the bid or ask. Every agent i assumes that i's behavior will not affect the likelihood of a particular bid or ask resulting in a trade. Furthermore, the agent assumes that the likelihood of a particular bid or ask resulting in a trade can be derived from information that the agent has observed and remembers from history.

We first provide the intuition of how the optimal bid and/or ask is determined by an agent. Suppose agent i is considering asking a. Then the profit if the ask is accepted is $(a - c_{i,t})$. The question for the agent, then, is, how likely is it that a will be accepted? In past trading behavior, there may be instances in which a seller offered to sell at a and it was (not) accepted. And there is additional information in the environment. First, an ask above a that was accepted is evidence that an ask at a will be accepted. Also, a bid above a that is made previously is evidence that ask a will be accepted. A similar intuition describes the history of past bids.

Implementation

Definition 8: Remembered History. For $H_n \in \mathcal{H}_n$, we make the following definitions:

Trade function. For a vector H_n, define a function T: $\mathcal{H} \rightarrow \{0,1\}^n$ by setting $T_k(H_n) = I_{\{h_{k,1} \cdot h_{k,2} > 0\}}(H_k)$. Then each component T_k of T indicates whether a trade occurred in the kth element of history.

Number of trades. Let $x = (x_1, x_2, \ldots, x_n)$. For each n, define S_n: $\{0,1\}^n \rightarrow N$ by setting $S_n(x) = \Sigma_{k=1}^{n} x_k$. Then $S_n(T(H_n))$ is the number of trades resulting from the first n messages.

Remembered history. Let L be the memory length of a given agent. For fixed n and H_n, to simplify notation, let $S = S_n(T(H_n))$. Let n' be the position of trades $(S - L)$ for $S > L$, and let $n' = 0$ if . Define $\tilde{H}_n^{(L)} = \{h_{n'+1}, h_{n'+2}, \ldots, h_n\}$.

Deletion of oa and ob from history. Let $n'' = \max \{k: T_k(H_n)) = 1\}$; that is, n'' is the index of the most recent trade. Let n^* be the index of the lowest (most recent) ask in the vector $\{h_{n''+1}, h_{n''+2}, \ldots, h_n\}$. Let be the index of the highest bid in the vector $\{h_{n''+1}, \ldots, h_n\}$. Note that if $T_n(H_n) = 0$, $h_{n,3}$ is either the outstanding ask or the outstanding bid as a consequence of the spread reduction rule, and if $T_n(H_n) = 1$, then there is no outstanding bid and no outstanding ask. If $T_n(H_n) = 0$ and $h_{n,1} = 0$, then $h_{n,3}$ is the outstanding bid. If $h_{k^*,1} \neq 0$ for some $k \in \{n''+1, \ldots, n-1\}$, then $n^* \neq \{\ \}$, and we define $H_n^{(L)}$ by $H_n^{(L)} \equiv \{h_{n'+1}, h_{n'+2}, h_{n^*-1}, h_{n^*+1}, \ldots, h_{n-1}\}$; that is, $H_n^{(L)}$ is $\tilde{H}_n^{(L)}$ with h_{n*} removed. The other case, in which $h_{n,3}$ is the outstanding ask, is treated similarly, because it is not known at time n if the outstanding ask or bid will be accepted. Then $H_n^{(L)}$ is the history remembered by agents with memory length L, who observe the history H_n.

Sets of asks and bids. Let $D_n^{(L)}$ be the set of all asks and bids that have been made in $H_n^{(L)}$, i.e., $D_n^{(L)} \equiv \cup_{k \in \{n'+1, \ldots, n\} \setminus \{n^*, n^*\}} \{h_{k,3}\}$.

Definition 9: Ask Frequencies. For each $d \in D_n^{(L)}$, let A(d) be the total number of asks that have been made at d, and let TA(d) be the total number of these that have been accepted. Let RA(d) = A(d) − TA(d) be the rejected asks at d.

For A(d), the counting procedure is as follows. For each $k \in \{n' + 1, \ldots, n\} \setminus \{n^*, n_*\}$, if $h_{k,3} = d$, $h_{k,1} \neq 0$, and $h_{k,2} = 0$, then A(d) is incremented by 1. If $h_{k,3} = d$ and $T_k\ (h_k) = 1$, then h_k is either a taken ask or a taken bid. To determine which is the case, find $m^* = \min\{m \geq 1: h_{k-m,3} = h_{k,m}\}$. If $h_{k-m^*,1} \neq 0$, then A(d) and TA(d) are incremented by 1. The rejected asks at d are given by RA(d) = A(d) – TA(d).

Definition 10: Bid Frequencies. For each $d \in D_n^{(L)}$, let B(d) be the total number of bids that have been made at d, and let TB(d) be the total number of these that have been accepted. Let RB(d) = B(d) – TB(d) be the rejected asks at d. The interpretations and counting procedures for B(d), TB(d), and RB(d) are analogous to those described in Definition 9 for asks.

Note that in what follows, the sets of asks and bids are frequently denoted D, with the subscripts and superscripts omitted. After n messages have been sent, the relevant set of asks and bids is $D_n^{(L)}$, and the relevant history is $H_n^{(L)}$.

Beliefs

Definition 11: Beliefs an Ask a Will Be Taken. For each potential ask $a \in D$, define $\hat{p}(a) = (\Sigma_{d \geq a} TA(d) + \Sigma_{d \geq a} B(d))/(\Sigma_{d \geq a} TA(d) + \Sigma_{d \geq a} B(d) + \Sigma_{d \leq a} RA(d))$. Then $\hat{p}(a)$ is an agent's belief that an ask a will be taken by a buyer. We assume that agents always believe that an ask at $a = 0.00$ will be accepted with certainty and that there is some valuation $M > 0$ such that $\hat{p}(M) = 0$.

Definition 12: Beliefs a Bid b Will Be Taken. For each potential bid $b \in D$, define $\hat{q}(b) = (\Sigma_{d \leq b} TB(d) + \Sigma_{d \leq b} A(d))/(\Sigma_{d \leq b} TB(d) + \Sigma_{d \leq b} A(d) + \Sigma_{d \geq b} RB(d))$. Then $\hat{q}(b)$ is an agent's belief that a bid b will be taken by a seller. We assume that agents always believe that a bid at $b = 0.00$ will be rejected with certainty and that there is some valuation $M > 0$ such that $\hat{q}(M) = 1$.

Spread Reduction Rule and Beliefs

The spread reduction rule has the effect of making the probability of a take for an ask $a \geq oa$ equal to 0 (where oa is the outstanding offer from Definition 4). We denote this modification of $\hat{p}(a)$ by $\tilde{p}(a)$, where $\tilde{p}(a) = \hat{p}(a)$ if $a < oa$ and $\tilde{p}(a) = 0$ if $a \geq oa$. Similarly, $\tilde{q}(b)$ for all $b \leq ob$. These facts are incorporated into agents' beliefs in the following definition.

Definition 13: Spread Reduction Rule. Let $\tilde{p}(a) = \hat{p}(a) \cdot I_{[0,oa]}(a)$ for each $a \in D$; that is, $\tilde{p}(a) = \hat{p}(a)$ if $a < oa$ and $\tilde{p}(a) = 0$ if $a \geq oa$. For all $b \in D$, let $\tilde{q}(b) = \hat{q}(b) \cdot I_{[ob,M]}(b)$.

Note that the function is non-increasing and the function is non-decreasing.

Expected Surplus Maximization

At time t, an agent has a certainty equivalent $c_{i,t}$. Should the agent make the ask a where a is taken from the set of previous bids and asks (absent ob and oa), the agent's expected surplus will be:

$$E[\pi_{i,t}(a, c_{i,t})] = (a - c_{i,t}) \cdot \tilde{p}(a). \tag{A1}$$

The maximum expected gain over all such previous asks is given by:

$$\mathrm{Max}_{a\in(ob,oa)}E[\pi_{i,t}(a,c_{i,t})]. \tag{A2}$$

Let a_j be the jth member of bids and asks in the interval that solves (A2).

Using linear interpolation, the agent assesses probability functions $\ddot{p}$ between a_{j-1} and a_j and a_{j+1} and solves:

$$\mathrm{Max}_{a\in(a_{j-1},a_{j+1})}E[\ddot{\pi}_{i,t}(a,c_{i,t})], \tag{A3}$$

where:

$$E[\ddot{\pi}_{i,t}(a,c_{i,t})] = (a - c_{i,t}) \cdot \ddot{p}(a) \tag{A4}$$

to find an a^*.

On the other hand, the agent may choose to bid. Should the agent offer the bid b, the agent's expected surplus will be:

$$E[\pi_{i,t}(b,c_{,t})] = (c_{i,t} - b) \cdot \tilde{q}(b). \tag{A5}$$

The maximum expected gain over all bids is given by:

$$\mathrm{Max}_{b\in(ob,oa)}E[\pi_{i,t}(b,c_{i,t})]. \tag{A6}$$

Let b_j be the jth member of bids and asks in the interval that solves (A6).

Using interpolation, the agent assesses probability functions $\ddot{q}$ between b_{j-1} and b_j and b_{j+1} and solves:

$$\mathrm{Max}_{b\in(b_{j-1},b_{j+1})}E[\ddot{\pi}_{i,t}(b,c_{i,t})], \tag{A7}$$

where:

$$E[\ddot{\pi}_{i,t}(b,c_{i,t})] = (c_{i,t} - b) \cdot \ddot{q}(b) \tag{A8}$$

to find a b^*.

Since (A3) and (A7) can result in negative surplus, the agent may choose to do no action at all. Therefore, the overall maximized surplus for agent i at time t is given by:

$$S_{i,t} = \mathrm{Max}\{E[\ddot{\pi}_{i,t}(a^*,c_{i,t})], E[\ddot{\pi}_{i,t}(b^*,c_{i,t})],0\}. \tag{A9}$$

Timing of Messages

At any point in time t, there is a set of messages $\{h_1, h_2,\ldots,h_{t-1}\}$. Each of these messages was sent in the form of a bid, ask, taken bid, or taken ask by a specific agent. The message at time t will reflect an action by one of the agents in the economy, and that action will maximize that agent's expected surplus. How fast an agent moves to take an action is assumed to be a stochastic function of the amount of expected surplus that an agent can achieve. Let $\tau_{i,t}$ represent the time at which agent i sends a message. Then:

$$P(\tau_{i,t} < \tau_{j,t}, \forall j \neq i) = \frac{S_{i,t}}{\sum_{j=1}^{n} S_{j,t}}.$$

This probability then determines the likelihood an agent's bid will be the one that appears in the history of the double auction.

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Special Purpose Vehicles: Empirical Evidence on Determinants and Earnings Management

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ABSTRACT: We investigate the use, determinants, and earnings effects of special purpose vehicles (SPVs). Based on a proxy of SPV activity that can be applied to a broad cross-section of firms over time, we find a two-and-a-half fold monotonic increase in the percentage of firms using at least one SPV during the eight-year period from 1997 through 2004. Tobit regressions of the determinants of SPV use show that SPV activity increases with financial reporting incentives and economic and tax motivations, but strong corporate governance tends to mitigate their use. In addition, the evidence is consistent with SPVs arranged for financial reporting purposes being associated with earnings management, whereas the same does not appear to be the case for SPVs set up mainly for economic, tax, and other reasons.

Keywords: *special purpose vehicles; off-balance sheet entities; earnings management; taxes; corporate governance.*

JEL Codes: *M41, G35.*

Data Availability: *Data are available from public sources.*

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I. INTRODUCTION

Special purpose vehicles (SPVs), also referred to as special purpose entities or variable interest entities, have attracted considerable attention from policymakers and regulators following some spectacular corporate scandals involving their use. Yet, not much is known about the prevalence of SPVs or the importance of different motivations associated with their use. In addition, despite concerns, much remains to be learned about SPVs' role in managing firms' earnings, as prior research has mostly focused on their balance sheet implications. In this study, we provide large-sample evidence on both of these issues. Specifically, we have two research objectives. First, we investigate the determinants of SPV use by examining the extent that SPV activity is explained by financial reporting motivations, economic and tax incentives, and corporate governance quality. Second, we examine whether SPVs formed primarily for financial reporting reasons are associated with earnings management. We base our analysis on a new proxy for SPV use that can be applied to a broad cross-section of firms over time.

An SPV is a legally distinct entity with a limited life created to carry out a narrow predefined activity or series of transactions for a "sponsor" company (Coallier 2002; Dharan 2002; Hartgraves and Benston 2002; Soroosh and Ciesielski 2004). SPVs can serve legitimate business purposes by raising capital for their sponsors and by isolating and homogenizing cash flows and business risks of a specific asset class. SPVs are also used frequently for tax purposes, especially for cross-jurisdictional tax planning and for optimally allocating tax benefits among investor classes. Despite these compelling economic motivations, much of the discussion around SPVs has centered on the financial reporting benefits that result when a sponsor avoids consolidating the SPV in its financial statements.[1] Specifically, treating the SPV as a separate entity allows a sponsor to not only hide debt, but also to manage its earnings.

The extensive investigations around Enron's collapse provide the most direct evidence about the role of SPVs in earnings management. The Special Investigative Committee on Enron reported that transactions with certain SPVs "allowed Enron to conceal from the market very large losses resulting from Enron's merchant investments" (Powers 2002, 4). Enron's court-appointed bankruptcy examiner explained that an important motivation for using SPVs was the "compensation structure that depended heavily on the reported financial performance of the company, with particular emphasis on the achievement of goals for net income and cash flow" (Batson 2003, 92). While Enron was arguably an extreme example, financial commentators (e.g., Bryan-Low and Brown 2002; Covert 2002; Cowan and Talley 2002), including Enron's auditor (Berardino 2001), caution investors that the company was not alone in its use of SPVs to mask its underlying financial risk and operating performance. Indeed, other SEC investigations, including PNC Financial, Conseco, and Amerco, reveal instances where SPV use has been intended to achieve financial reporting objectives.[2] Summarizing its descriptive study of SPVs conducted under the mandate of the Sarbanes-Oxley legislation, the SEC's staff wrote:

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[1] Until 2003, per EITF 90-15, SPV consolidation could be avoided if outside investors maintained equity of at least 3 percent of the SPV's total capitalization (FASB 1990). Although this guidance was provided for leasing transactions, the SEC staff's response to the bulletin effectively extended the 3 percent test to other transactions. In response to perceived abuses involving SPVs, FASB issued FIN No. 46(R) (FASB 2003), a principles-based guidance for consolidating and disclosing SPVs, and a recent Exposure Draft amending FIN No. 46(R) (FASB 2008). Both pronouncements are discussed in more detail later.

> Issuers often structure transfers in order to achieve or avoid sale accounting, trigger or avoid the recognition of losses (or gains), or change the measurement attribute applied to the recorded assets and liabilities. The Staff believes, based on its reviews of issuer filings, that the most frequent structuring goal is to achieve sale treatment without consolidation of any related SPEs. While economic motivations for most asset transfers exist, some transfers of financial assets appear to be significantly, primarily, or even solely entered into with accounting motivations in mind. (SEC 2005, 45)

The SEC's and FASB's recent regulatory response requiring disclosure of off-balance sheet entities and increasing the requirements for excluding SPV effects from sponsor financial statements, respectively, underscores the importance of their concerns.

To perform our empirical analysis, we employ a proxy for SPV use that is a count of the limited partnerships, limited liability partnerships, limited liability companies, and trusts included in the list of subsidiaries and affiliates in Exhibit 21 of the SEC Form 10-K. We choose this proxy because: (1) it applies to a broad cross-section of firms over a time period when few disclosure requirements concerning SPVs existed, and (2) SPVs are typically organized using one of these "flow-through" legal structures (Dharan 2002; Clauss and Reed 2003; Soroosh and Ciesielski 2004), which was corroborated by the staff of the SEC's Office of the Chief Accountant and anecdotal evidence surrounding Enron and other companies.[3]

Using a sample of 6,473 firms from 1997 to 2004, we obtain 22,604 firm-year observations for which Exhibit 21 and other requisite data are available. During this eight-year period, we find a two-and-a-half fold increase in the percent of observations reporting at least one SPV (from 23 percent in 1997 to 59 percent in 2004). SPV use appears highest among industry groups that tend to be leasing-activity intensive, such as trading, real estate, and construction, traditionally viewed as one of the main activities involving SPV use. We also find relatively high SPV use in banking and telecommunications, consistent with these industries providing new avenues for SPV use during the 1990s, such as the securitization of financial assets and broadband capacity (Dharan 2002).

With respect to investigating the determinants of SPV use, Tobit regression results show that SPV activity is increasing in financial reporting incentives and economic motivations, but strong corporate governance mitigates SPV use. Specifically, we find that SPV use is positively related to: (1) leverage, (2) CEO bonus compensation, (3) availability of funds, and (4) demand for tax benefits, but decreasing in board independence and independent directors' stockholdings. These results are robust to a variety of sensitivity tests, including the use of other model specifications besides Tobit (e.g., logit and OLS), different sample selection criteria, and alternative definitions of the dependent and independent variables. In terms of economic magnitude, inter-quartile increases in leverage, availability of funds, intangible assets, and board independence result in changes in expected SPVs of 1.31, −0.36, 1.05, and −1.04, respectively. These effects are quite large given that more than 70 percent of our sample observations have zero or one SPV. Also, SPV use is increasing in firm size, consistent with larger firms having greater technical expertise to handle the complexity of structured financing arrangements (SEC 2005).

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[2] In particular, these investigations indicate that SPVs have been improperly used for earnings management. For instance, PNC Financial transferred $762 million in troubled (nonperforming) loans and venture capital investments to SPVs in order to overstate 2001 pretax earnings by $240 million, a 52 percent overstatement of earnings per share (SEC 2002). For its part in facilitating PNC Financial's illicit use of SPVs, AIG paid $126 million in penalties, interest, and disgorgement to the SEC (SEC 2004b). In a separate investigation, the SEC found that Conseco Inc. used SPVs to hide declines in the values of securities, thus overstating its 1999 earnings by $367 million (SEC 2004a). Amerco's July 2002 Form 10-K restatement of 2001 earnings includes the losses of a previously excluded SPV that decreased the company's earnings by $12 million, or 92 percent of previously reported earnings.

[3] Enron's SPVs listed in its Exhibit 21 were mostly organized as limited partnerships and their number grew dramatically from 31 in 1994 to 850 in 2000 (see Appendix A). Many of these SPVs, such as Raptor, Raven, and Whitewing that were both organized as LPs and listed in Exhibit 21 of the company's 2000 10-K, played key roles in hiding losses and concealing debt, which when disclosed contributed to Enron's collapse. Powers (2002) details Enron's SPV structures and transactions. See also Dharan (2002), Emshwiller and Smith (2002), Yale (2002), and Goldin (2003) for discussions of Enron's use of SPVs.

With respect to examining SPVs' role in earnings management, we use the Tobit regression results to parse the number of SPVs for each firm-year into those predicted by financial reporting motivations, those predicted by economic considerations, and those predicted by other variables. We then investigate the relation between these predicted SPV components and two measures of earnings management—discretionary accruals and frequency of small profits or losses. We hypothesize that SPVs arranged for financial reporting reasons are likely to be positively associated with earnings management measures, whereas we do not expect a similar relation for SPVs arranged for other reasons. Our evidence, based on both univariate and regression tests, is consistent with this hypothesis. The economic magnitude of this association appears to be substantial. For example, when the number of predicted SPVs for financial reporting purposes increases by one, on average the probability that a firm reports a small gain instead of a small loss increases by 18 percent.

Our study makes two main contributions. First, to our knowledge, we provide the first documentation of the prevalence and determinants of SPV use in a large cross-temporal sample. Prior studies tend to conduct focused examinations of SPV use in particular transactions, such as research and development financing (e.g., Shevlin 1987; Beatty et al. 1995) and asset securitizations (e.g., Karaoglu 2005; Dechow et al. 2008). Although a transaction-level focus has the merit of pinpointing the circumstances of SPV use, it also usually necessitates reliance on small samples or short time periods, both of which limit the ability to generalize results.

Second, we contribute to the literature on the financial statement effects of SPVs. While previous large-sample research primarily investigates SPVs' balance sheet effects (e.g., Mills and Newberry 2005), we document the role of SPVs in earnings management. As the SEC (2005) report highlights, by not consolidating SPVs, sponsors are able not only to hide debt, but also to manage earnings, with important implications for both managerial compensation and stock prices (e.g., Murphy 2000; Dechow and Skinner 2000). In this regard, our study is similar to Dechow et al.'s (2008) study of corporate governance and earnings management in the context of asset securitizations, although their sample is limited to 84 firms with post-September 2000 asset securitizations.

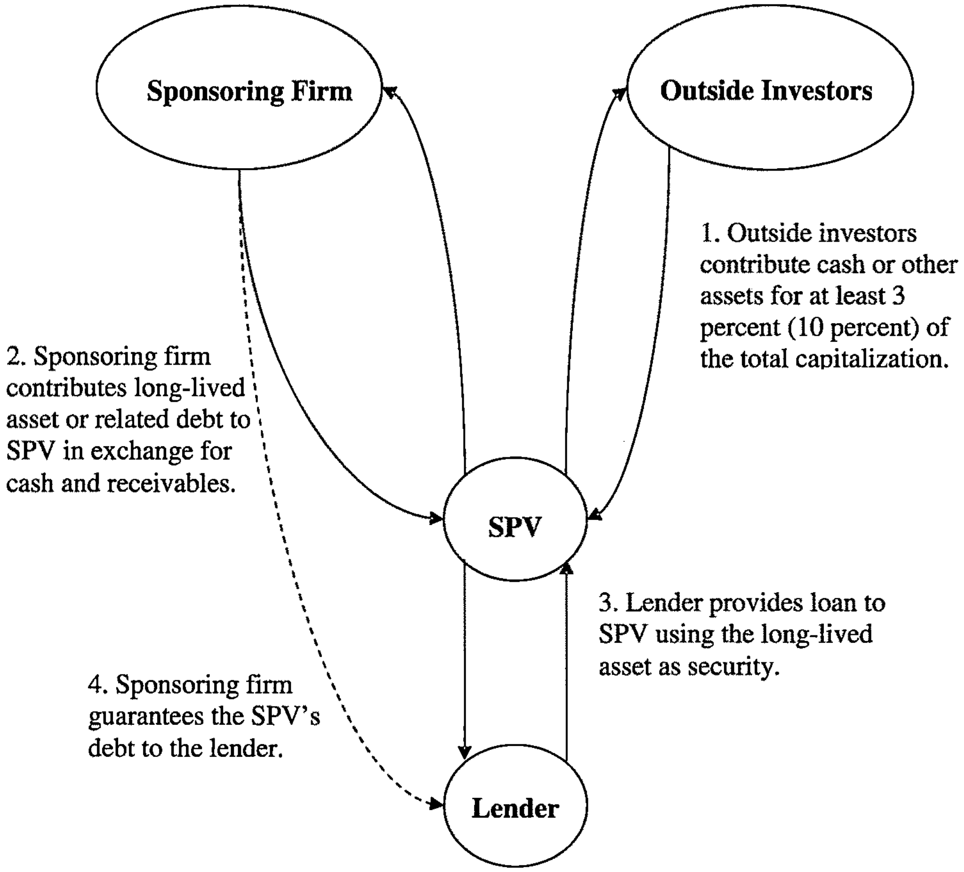
Section II provides some institutional background leading to a conceptual model of SPV use. Section III defines our SPV proxy and describes the sample, Section IV presents the empirical model, and Sections V and VI, respectively, report the results for the determinants of SPV use and the earnings management tests. Section VII concludes and offers suggestions for further research.

II. INSTITUTIONAL BACKGROUND AND MODEL DEVELOPMENT

SPV Formation and Basic Economic Motivations for SPV Use

SPVs have long been used in a variety of financial arrangements, although their use in leasing and securitization transactions is most well known (Hodge 1998; SEC 2005). Figure 1 outlines a typical SPV formation. The steps usually occur in coordinated fashion rather than in chronological order, with details of the steps differing depending on the sponsor's particular needs and the SPV's use (i.e., leasing or asset securitization). Typically, a sponsor creates a separate legal entity (SPV) to carry out one or more transactions of the circumscribed activities (Gorton and Souleles 2006). The SPV then obtains equity investment from

FIGURE 1
Transactions Involved in Forming a Typical Special Purpose Vehicle (SPV)


Sponsoring Firm
Outside Investors
1. Outside investors contribute cash or other assets for at least 3 percent (10 percent) of the total capitalization.
2. Sponsoring firm contributes long-lived asset or related debt to SPV in exchange for cash and receivables.
SPV
3. Lender provides loan to SPV using the long-lived asset as security.
4. Sponsoring firm guarantees the SPV's debt to the lender.
Lender

The figure diagrams the transactions involved in forming an SPV. The sponsor begins by forming an SPV, typically as a limited partnership, a limited liability partnership, a limited liability company, or a trust. Although not in sequential order, the sponsor contributes an identifiable asset or group of assets to the SPV in exchange for cash proceeds from forthcoming credit financing prior to 2003 (after 2002), or a contract granting the sponsor the right to use the asset(s). Second, unrelated investors contribute at least 3 (10) percent of the "at risk" investment in exchange for residual equity interest(s) in the SPV. Third, using the asset as security and a guarantee from the sponsor, the SPV obtains credit financing from an outside lender and uses the proceeds to compensate the sponsor for its asset contribution.

unrelated investors and borrows money. Using these funds, the SPV either purchases asset(s) from the sponsor, or buys asset(s) from an unrelated third party and leases it (them) to the sponsor. Either way, a sponsor using an SPV raises off-balance sheet capital that can be used for repaying debt, funding operations, or facilitating expansion.

The sponsor typically reduces the risk of outside SPV investors (creditors and residual equity holders), by guaranteeing the loan(s) and/or agreeing to incur a portion of the potential losses associated with the asset(s) transferred to the SPV, as well as by providing implicit recourse (Calomiris and Mason 2004; Higgins and Mason 2004; Gorton and Souleles 2006). Thus, although the sponsor usually remains liable, SPV assets are legally isolated from the sponsor's bankruptcy risk. This "bankruptcy-remote" characteristic insulates lenders from the sponsor's insolvency or bankruptcy risks, with the lower credit risk resulting in raising needed funds at lower borrowing costs. Further, assets with similar risk characteristics are grouped together in SPVs to appeal to target investors with specific risk preferences.

Finally, SPVs are often created as flow-through entities, such as LPs or LLCs, to afford maximum flexibility in allocating tax benefits to those investors who can best utilize them. Flow-through entities have proliferated since the enactment of the Federal "check-the-box" rules in 1996. IRS Notice 95-14 (1995-1 CB 295) allows hybrid entities, such as LPs and LLCs, to elect to be treated as partnerships for income tax purposes and thus be subject to only a single level of tax while enjoying the benefits of limited liability protection. Previously, limited liability was available only to corporations that are subject to at least two levels of taxation (corporate plus shareholder level). Apart from the federal tax benefits, flow-through entities in general, and LLCs in particular, have been employed extensively in multistate tax planning (Fox and Luna 2005). The principal tax-planning techniques involve their use in intangible holding companies (also known as passive investment companies) into which intangibles are transferred. This transfer allows income to be shifted from high-tax states into low-tax states, thereby reducing multistate firms' state income tax liabilities.[4] Consistent with tax planning through income shifting, Gupta and Mills (2002) find that multistate corporations' state effective tax rates decrease (and then increase) in the number of states in which they file returns and that firms use the apportionment formula differences to reduce their state effective tax rates. In summary, raising capital, isolating and homogenizing business risk, and capitalizing on tax incentives together constitute the primary economic motivations for sponsoring SPVs.

Financial Reporting and Earnings Management Motivations for SPV Use

SPVs can also offer financial reporting discretion by giving the sponsor increased control over the timing and amount of earnings reported on its income statement, as well as the amount of debt reported on its balance sheet. Since the SPV's ("special purpose") activities are narrowly circumscribed by charter, and contracts with the sponsor can be specified in advance, the sponsor can effectively control the SPV's actions and retain most of the SPV's risks and rewards even without majority voting rights (Weidner 2000;

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[4] These planning techniques succeed because some states require combined reporting of affiliated entities, whereas others allow separate reporting. By strategically locating the intangible holding companies in separate reporting states, income from intangibles can be sheltered in low-tax jurisdictions while obtaining deductions in high-tax jurisdictions. Other state tax-planning techniques involve exploiting variation among states' income tax apportionment regimes and the throwback rule, such that sales revenues can disappear into "nowhere" and completely escape taxation (Gupta and Mills 2002).

Berardino 2001; Soroosh and Ciesielski 2004). Until 2003, U.S. GAAP employed a unilateral control approach based primarily on voting rights to determine whether SPV financial statements should be consolidated into the sponsor's statements. The principal test for excluding an SPV from the sponsor's financial statements was whether third party residual equity investment at risk equaled at least 3 percent of the SPV's total capitalization.[5] As a result, by obtaining a limited amount of outside equity investment, the sponsor could avoid consolidating the SPV despite controlling the SPV through other channels. By controlling both entities involved in the transaction, but only reporting the transactions from the sponsor's perspective, the sponsor gains considerable flexibility in managing its reported earnings and debt. Since this study focuses on earnings effects, we next discuss how a sponsor typically manages earnings using two main categories of SPVs, sale-leaseback, and receivables securitization.

In a sale-leaseback transaction, the sponsor sells a fixed asset to the SPV and leases it back. The sponsor exercises substantial control over (1) the selling price of the fixed asset, and (2) the amount and timing of the operating lease payments. By influencing the selling price of the asset, the sponsor can recognize a gain and thus increase its earnings, which come as either cash flows or accruals, depending on how much of the selling price the SPV pays initially. Also, by transferring the asset to the SPV, the sponsor can defer recognizing expenses, such as depreciation and asset impairment, potentially increasing near-term future earnings and accruals. By controlling the schedule of lease payments, the sponsor can also defer its cash lease payment and thus increase its near-term earnings and cash flows.

With a receivable securitization SPV, the sponsor typically sells one or more preferred interests in a class of receivables (or a series of receivables to be transferred in the future) to an SPV, and retains a residual interest in the remaining receivables (retained interest). In this case, the sponsor can exercise discretion over the amount of receivables sold, and the estimated value of the retained interest (Dechow et al. 2008). By selling more receivables or inflating the value of the retained interest, the sponsor can manage earnings and accruals upward.[6]

As an earnings management tool, SPVs have some unique advantages. First, while SPVs can involve complex structures and coordination across multiple parties, the amounts of gains and losses that are recognized or deferred can be relatively arbitrary and remain so until the end of an accounting period. Consistent with the argument that this flexibility facilitates target-based earnings management, Dechow and Shakespeare (2009) find that a disproportionately large percentage of securitization transactions occur in the last few days of the third month of the quarter. Second, because the SPV typically borrows using debt guaranteed by the sponsor, SPV-enabled earnings management also has the potential of generating cash that is subject to the sponsor's control.

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[5] Starting in 2003, FIN No. 46(R) changed the focus for consolidating a SPV from voting control to risks and rewards, requiring that a "variable interest entity" (VIE) must be consolidated in the financial statements of the "primary beneficiary" (FASB 2003). FIN No. 46(R) also increased the minimum third-party investment requirement from 3 to 10 percent. In a new Exposure Draft issued on September 15, 2008, FASB has proposed amending FIN No. 46(R) to further expand disclosure of VIE involvement, including disclosure even if the firm does not hold a significant interest in a VIE (FASB 2008). The new proposed rule further underscores FASB's perceptions of ongoing concerns about the timeliness, completeness, and overall representational faithfulness of VIE-related disclosures.

[6] The proceeds and the resulting gain or loss recognized by the sponsor can also be impacted by the value of guarantee(s) provided by the sponsor. These guarantees may have cash flow impacts to the sponsor though, prior to FIN No. 45 (FASB 2002), GAAP generally did not require the sponsor to quantify these impacts at the time of the transfer.

Corporate Governance and SPVs

As the SEC (2005) study notes, corporate scandals involving SPVs not only exposed weaknesses in financial reporting, but also raised questions about the role of corporate governance as a determinant of SPVs. However, SPVs can serve both economic and financial reporting purposes. If board members cannot determine the SPV's main purpose, then it is unclear whether they would encourage or discourage SPV use. If board members can determine the purpose for setting up the SPVs, then we would expect boards to encourage use of SPVs arranged for economic purposes as they are likely to increase firm value. On the other hand, if board members determine that SPVs are arranged for financial engineering, then strong governance characteristics should limit organizational commitment to earnings management and thus mitigate SPV use.

Based on the above discussion, our conceptual model of the determinants of SPV use follows:

$$\text{SPV use} = f\,(\text{financial reporting variables, economic variables, corporate governance variables, and other controls}).$$

Financial reporting variables capture contracting arguments, such as debt covenants, managerial compensation, and external financing needs; economic variables proxy the risk clienteles, availability of funds, and demand for tax benefits; corporate governance variables reflect board characteristics; and controls include firm size, industry membership, and year effects. We develop empirical proxies for these concepts in Section IV.

III. MEASURE OF SPV USE, SAMPLE SELECTION, AND VALIDITY CHECKS

Measure of SPV Use

We measure SPV use with a computer algorithm that counts the number of subsidiaries or affiliates listed in Exhibit 21 (or in some cases Exhibit 22) of SEC Form 10-Ks with names that contain the words "Limited Partnership," "Limited Liability Partnership," "Limited Liability Corporation" (or their acronyms "L.P.," "LP," "LLP," "L.L.P.," "LLC," "L.L.C."), or "trust." SEC regulations require that firms list subsidiaries in the annual 10-K (SEC Regulation S-K Subpart 229.601(b)(21)(i)), where "subsidiary" is defined as an affiliate that the firm controls directly or indirectly (SEC Regulation S-X Part 210.1-02(x)), an "affiliate" is defined as a person who directly, or indirectly through intermediaries, controls, is controlled by, or is under common control with the person specified (Regulation S-X Part 210.1-02(b)), and a "person" can be an individual or any type of business or not-for-profit entity (Regulation S-X Part 210.1-02(q)).

The SEC defines "control" as "the possession, direct or indirect, of the power to direct or cause the direction of the management and policies of a person, whether through the ownership of voting shares, *by contract,* or otherwise" (Regulation S-X Part 210.1-02(g); emphasis added). Because control can occur via contract, SPVs fall within the SEC's definition of a subsidiary. Consistent with these requirements, Enron listed in its 10-K Exhibit 21 many of the SPVs that have been identified as excluded from its balance sheet but used to manage debt and earnings (see Appendix B).

Sample Selection and Descriptive Statistics

We begin with the 33,244 Form 10-Ks that list subsidiaries and affiliates in Exhibit 21 and were filed with EDGAR between December 1, 1994 and December 17, 2004. After deleting observations not in the Compustat database or lacking SIC information, 25,844 observations for 6,892 firms remain. Because many companies did not file their 10-Ks electronically before 1997, we also exclude observations from 1994 through 1996, resulting in 22,604 observations for 6,473 firms that form the basis of our large-sample descriptive evidence on the prevalence and extent of SPV use. Because our regression tests have greater data requirements for calculating the financial reporting, economic, and corporate governance variables, the sample for these tests is further reduced to 3,885, 3,660, and 2,403 firm-years, respectively. The decrease in sample size is caused primarily by the requirement for managerial compensation data because we obtain that data from ExecuComp, which is limited to the S&P 1500 companies. Table 1 summarizes the sample selection.

In terms of the large sample descriptive data on SPV activity, Figure 2, Panel A shows that 9,470 of 22,604 firm-years (42 percent) report at least one LP, LLP, LLC, or trust. Figure 2, Panel B classifies these 9,470 observations by the number of SPVs listed in Exhibit 21. The most frequent SPV count is one (2,867 firm-years, or 13 percent). The number of observations reporting more than one SPV steadily decreases, although approximately 1,720 firm-year observations (7 percent) disclose more than 10 SPVs.

Panel A of Table 2 reports the frequency and extent of SPV use between 1997 and 2004, by year. We winsorize the top 1 percent of the distribution for the number of SPVs to mitigate the effect of outliers. The percentage of firms reporting at least one SPV increases monotonically from 23 percent in 1997 to 59 percent in 2004, with the mean

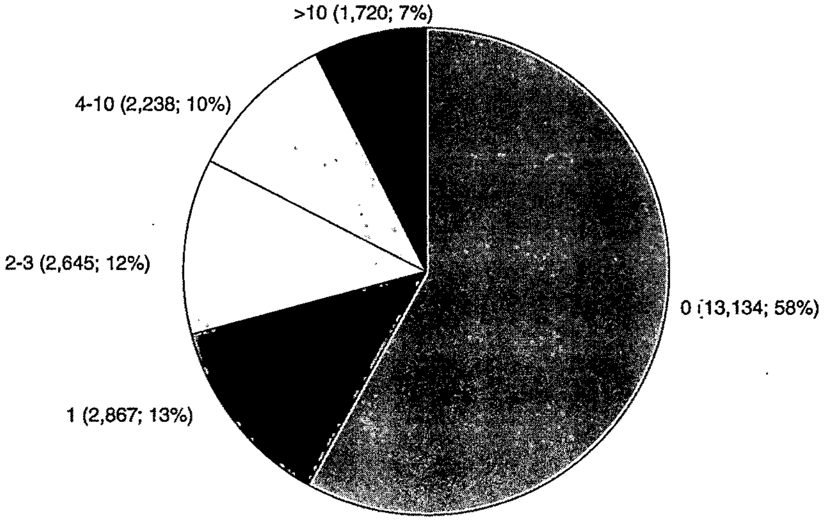
TABLE 1
Sample Selection

	Number of Firm-Year Observations	Number of Unique Firms
10-Ks with Identifiable Exhibit 21 from which the Number of SPVs can be Determined	33,244	9,085
Less: Observations without the GVKEY Identifier Needed to Match with Compustat Data	(4,823)	(1,768)
Less: Observations without SIC or Fiscal Year-End Data on Compustat	(2,577)	(425)
10-K with Exhibit 21 Information and Basic Compustat Financial Data	25,844	6,892
Less: Observations from 1994 through 1996	(3,240)	(419)
Observations after 1996	22,604	6,473
Less: Observations without Financial Reporting Data	(18,719)	(5,217)
Observations with Financial Reporting Data	3,885	1,256
Less: Observations without Economic Factor Data	(225)	(83)
Observations with Both Economic and Financial Reporting Data	3,660	1,173
Less: Observations without Corporate Governance Data	(1,257)	(254)
Observations with Economic, Financial Reporting and Corporate Governance Data	2,403	919

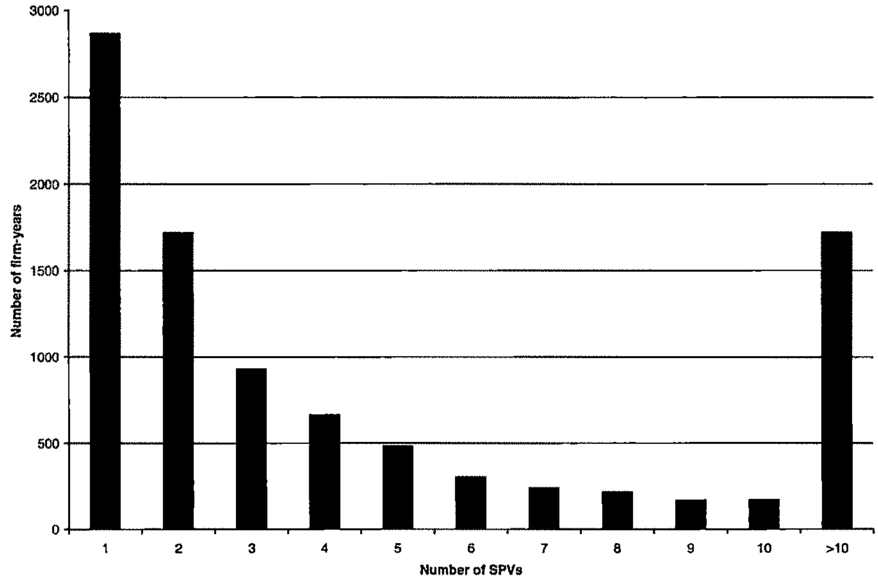
Special Purpose Vehicles (SPVs) are identified using the list of subsidiaries and affiliates in Exhibit 21 of Form 10-Ks from December 1994 to December 2004. The count of SPVs is based on entities denoted as either a Limited Partnership, Limited Liability Partnership, Limited Liability Corporation, "L.P.," "LP," "L.L.P.," "LLP," "L.L.C.," "LLC," or "Trust." The larger sample of 22,604 firm-year observations is used for the descriptive statistics and the smaller samples (i.e., 3,885, 3,660, and 2,403 firm-years) that result from additional data requirements are used in the regression tests.

FIGURE 2
Distribution of Sample Observations by Number of SPVs

Panel A: Number of SPVs, Including Observations Indicating no SPVs



Panel B: Number of SPVs, Excluding Observations Indicating No SPVs



Panel A provides a distribution of the number of SPVs based on 22,604 firm-year observations filed with EDGAR between January 1997 and December 2004 with available Exhibit 21 information and basic Compustat data on industry-membership.

Panel B provides a distribution of the 9,470 non-zero SPV observations based on the number of SPVs reported.

TABLE 2
Distribution of Sample Observations across Time and Industry

Panel A: Distribution of Sample Observations by Year

Year	Number of Observations	Number (percent) of Firms Indicating at Least One SPV	Mean (Median) Number of SPVs Reported among Firm-Years Indicating at Least One SPV	Number (percent) of Firms Indicating at Least One SPV of this Type: LLC	LP/LLP	Trust
1997	2,669	619	7.33	301	320	182
		(23.19)	(2)	(11.28)	(11.99)	(6.82)
1998	2,794	812	7.43	482	404	219
		(29.06)	(2)	(17.25)	(14.46)	(7.84)
1999	2,759	989	9.39	675	452	258
		(35.85)	(2)	(24.47)	(16.38)	(9.35)
2000	2,653	1,067	10.18	799	478	259
		(40.22)	(2)	(30.12)	(18.02)	(9.76)
2001	2,652	1,166	11.79	932	491	243
		(43.97)	(2)	(35.14)	(18.51)	(9.16)
2002	2,778	1,332	11.55	1,097	560	266
		(47.95)	(3)	(39.49)	(20.16)	(9.58)
2003	3,546	1,871	13.01	1,570	791	408
		(52.76)	(3)	(44.28)	(22.31)	(11.51)
2004	2,753	1,614	16.05	1,376	682	377
		(58.63)	(4)	(49.98)	(24.77)	(13.69)
Total	22,604	9,470	11.63	7,232	4,178	2,212
		(41.90)	(3)	(31.99)	(18.48)	(9.79)

(continued on next page)

TABLE 2 (continued)

Panel B: Distribution of Sample Observations by Fama and French (1997) Industry Categories

Fama and French (1997) Industry Categories	Number of Sample Observations	Number of Observations Indicating at Least One SPV	Proportion of each Industry Category Indicating at Least One SPV	Mean Number of SPVs Reported among Firm-Years Indicating at Least One SPV	Median Number of SPVs Reported among Firm-Years Indicating at Least One SPV
Trading	1188	912	0.77	37.07	12
Candy and Soda	30	22	0.73	7.55	7.5
Real Estate	217	149	0.69	17.09	5
Coal	24	15	0.63	17.00	15
Construction	315	183	0.58	27.81	7
Restaurants, Hotel, and Motel	438	258	0.59	12.59	3
Banking	2190	1230	0.56	7.53	2
Telecommunications	738	422	0.57	13.12	4
Petroleum and Natural Gas	608	360	0.59	5.55	3
Healthcare	422	223	0.53	31.01	7
Shipping Containers	66	38	0.58	2.82	2
Personal Services	259	144	0.56	16.95	4
Entertainment	350	178	0.51	6.63	3
Printing and Publishing	216	110	0.51	4.33	3
Utilities	718	390	0.54	36.13	5
Chemicals	336	172	0.51	4.92	2.5
Steel Works	280	142	0.51	3.03	2
Tobacco Products	20	10	0.50	5.30	3
Food Products	307	135	0.44	8.49	2
Shipbuilding, Railroad Equipment	58	26	0.45	4.46	2
Automobiles and Trucks	298	132	0.44	5.23	2
Retail	1196	531	0.44	6.92	2
Transportation	432	189	0.44	5.92	2
Insurance	823	341	0.41	6.37	2

(continued on next page)

TABLE 2 (continued)

Fama and French (1997) Industry Categories	Number of Sample Observations	Number of Observations Indicating at Least One SPV	Proportion of each Industry Category Indicating at Least One SPV	Mean Number of SPVs Reported among Firm-Years Indicating at Least One SPV	Median Number of SPVs Reported among Firm-Years Indicating at Least One SPV
Fabricated Products	95	40	0.42	3.23	2
Beer	45	15	0.33	4.47	2
Agriculture	63	28	0.44	12.07	5.5
Construction Materials	426	174	0.41	4.03	2
Miscellaneous	170	61	0.36	5.56	3
Aircraft	80	32	0.40	2.47	1
Business Supplies	257	100	0.39	3.40	2
Rubber and Plastic Products	184	69	0.38	2.20	2
Defense	26	8	0.31	5.88	3
Wholesale	841	298	0.35	4.66	2
Machinery	699	245	0.35	3.91	2
Business Services	3031	938	0.31	4.28	2
Textiles	136	48	0.35	2.54	2
Apparel	296	93	0.31	2.75	2
Electrical Equipment	201	61	0.30	4.56	2
Nonmetallic Mining	40	13	0.33	9.54	5
Consumer Goods	380	113	0.30	2.48	2
Toys	173	47	0.27	2.91	2
Measuring and Control Equipment	446	98	0.22	4.76	2
Computers	912	185	0.20	4.01	2
Electronic Equipment	1153	239	0.21	2.90	2
Pharmaceutical Products	847	155	0.18	3.73	1
Medical Equipment	517	92	0.18	5.58	2
Precious Metals	57	6	0.11	1.00	1
Total	22,604	9,470	0.42	11.63	3

Panel A reports the distribution of the 22,604 sample observations by year and, for each sample year, the percentage of firms indicating at least one SPV, the mean and the median number of SPVs, and the percentages of firms indicating at least one SPV by type.

Panel B reports the distribution of the sample observations across the Fama and French (1997) industry categories listed in descending order based on the relative proportion of firms indicating at least one SPV. The top 1 percent of the distribution for the number of SPVs is winsorized.

(median) number of SPVs growing from 7.33 (2.0) in 1997 to 16.05 (4.0) in 2004. The mean is much greater than the median because the distribution of SPVs is right-skewed. The last three columns categorize the SPVs by type (LLC, LP/LLP, and trust), and report the number (percentage) of firms with at least one SPV for each type. Clearly, use of each type of SPV increased monotonically from 1997 to 2004, with a marked increase in LLCs. It is possible that after Enron (or FIN No. 46(R)), firms began to more fully disclose entities that had already existed. Thus, our SPV count measure could overstate the increase in SPV formations in later years.

Panel B of Table 2 reports the sample distribution across the 48 Fama and French (1997) industry categories, listed in descending order by the relative proportion of firms within each industry reporting at least one SPV. SPV incidence is highest among industry groups usually considered leasing-intensive, such as trade, real estate, and construction.[7] The higher incidence of SPVs in banking and telecommunications is consistent with the increasing use of SPVs during the 1990s for securitization of many types of financial assets and broadband capacity (Dharan 2002). The variation in SPV use across industry groups suggests the need to control for industry membership in the empirical tests.

Validity Checks and Measurement Error issues for the SPV Measure

We conduct four tests to validate our SPV activity measure. The first test relies upon the popular press to identify firms using SPVs. Specifically, we search Factiva's "Major News and Business Publications: U.S." category between January 1–December 31, 2002 for articles mentioning the term "special purpose entity(ies)" at least twice. We choose 2002 because much of the discussion about SPVs appeared in the popular press following the Enron meltdown at the end of 2001. The search resulted in 89 articles that identified 30 firms as utilizing one or more off-balance sheet SPVs. We successfully matched 24 of these 30 firms to our Exhibit 21 sample. If our SPV measure is a good proxy of SPV activity, we should observe a higher incidence of SPVs based on our measure for these 24 firms. Consistent with our expectation, we find that of the 24 firms, 21 (87.5 percent) indicate at least one SPV in Exhibit 21 and 20 (83.3 percent) indicate two or more SPVs in Exhibit 21, compared with 47.9 percent and 30.7 percent, respectively, in our overall sample for 2002. Similarly, the median Exhibit 21 SPV count for these 21 firms is six, compared with three in our overall sample for 2002. Both the percentage of firms with at least one SPV and median number of SPVs for the popular press sample are significantly greater than our overall 2002 sample ($p < .01$). Thus, popular press assertions of SPV use support our Exhibit 21 measure.

Second, because SPVs are often used in connection with asset securitizations, we examine the frequency with which our SPV measure occurs in a sample of 66 publicly reported asset securitization transactions of at least $200 million during 2001 and 2002.[8] Of the 53 observations that match our sample during those years, 46 (86.9 percent) list at least one LP, LLP, LLC, or trust in Form 10-K Exhibit 21. This percentage is nearly double the 46 percent of the combined 2001 and 2002 overall sample that reports at least one SPV in Exhibit 21, suggesting that our SPV measure likely captures the asset securitization activity for which SPVs are typically used.

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[7] Real estate and natural resource industries are often characterized by project financing, an approach in which SPVs (e.g., LPs and LLCs) are utilized for economic and legal reasons, are listed in Exhibit 21 and, importantly, may be consolidated for financial reporting purposes. However, inclusion of such consolidated SPVs adds noise and biases our tests against finding significant results.

[8] We thank Cathy Shakespeare for providing this data.

Third, we search for the terms "special purpose entity(ies)" and "variable interest entity(ies)" in the entire Form 10-Ks filed electronically with the SEC between January 1997 and December 2004. Approximately 16 percent of the filings (4,508 of 28,245 firm-years) mention either term at least once.[9] Of these, 63.6 percent (2,869 of 4,508) list at least one LP, LLP, LLC, or trust in their Exhibit 21s. This percentage falls to 40.3 percent (9,571 of 23,737) for firms that do not mention either of the two terms. The difference in these percentages is highly significant ($p < .01$), providing support for the conceptual link between Exhibit 21 entities and SPVs.[10]

Fourth, since firms might deny using SPVs in their 10-K, the text search we conduct in the third validity test may misclassify those firms as having SPVs. To classify firms more accurately, we searched the 10kwizard.com database of all 10-K filings with the SEC between 1/1/97 and 12/31/02 and identified 1,232 firm-years that mentioned either "special purpose entity(ies)" or "variable interest entity(ies)." We matched this sample with our sample of 3,885 firm years with financial reporting data and found 180 matches. Based on a careful reading of the 180 filings, we were able to classify 105 (58 percent) as definitively having sponsored one or more SPVs, 52 (29 percent) as definitively not having sponsored any SPVs, and the remaining 23 (13 percent) as firm-years for which it is unclear whether the firm had sponsored a SPV. Of the 105 firm-years that definitively indicate SPV use, our Exhibit 21 measure correctly indicates SPV use by 80 (76 percent). Conversely, of the 52 firms that explicitly deny sponsoring SPVs, our Exhibit 21 measure indicates SPV use by 25 (48 percent). A potential explanation for the large false positives is that flow-through entities could be set up for the tax incentives, as discussed earlier. However, the Pearson correlation between the 10-K disclosures of the 157 (105 + 52) firm-years that explicitly indicate sponsoring or deny sponsoring SPVs and our Exhibit 21 based measure of SPVs is positive and significant (0.2811, $p < .01$).

Despite the validity tests that support the use of Exhibit 21 data to identify SPVs, our SPV measure is subject to two types of measurement error: (1) inclusion of SPVs in Exhibit 21 that are consolidated in the financial statements, and (2) exclusion of SPVs that are not LPs, LLPs, LLCs or trusts, or that are not listed in Exhibit 21. In the first case, since consolidation removes the financial reporting benefits described earlier, this measurement error should not bias our results toward finding an effect for the financial reporting motivations. In the second case, there are two possibilities: (1) SPV exclusion is random, in which case it potentially biases against finding effects for both financial reporting and economic motivations; and (2) SPV exclusion is due to self-selection, in which case it should also generally bias against our predictions. For example, if firms are more likely to list in (omit from) Exhibit 21 SPVs set up for economic (financial reporting) reasons, then the power of the test for our financial reporting variables would be reduced.

In addition, even an accurate count of the number of SPVs is a noisy measure of the economic activity engaged in by these entities. To the extent that the average economic magnitude of SPVs varies randomly across firms, this error adds noise and reduces the power of our tests. Alternatively, it seems likely that firms with strong economic and financial reporting incentives would be inclined to create SPVs with greater than average economic magnitude. In that case, the average economic magnitude of SPVs for firms with strong (weak) financial reporting and economic incentives is large (small), and our SPV count measure would underestimate the cross-sectional variation in the economic magnitude of SPV activity between firms with strong and weak incentives. This underestimated variation in the dependent variable would bias against finding significant results for the determinants of SPVs. In summary, while our SPV measure is likely subject to measurement error, we believe the resulting noise should bias our tests against finding results rather than in favor of finding the predicted relationships.

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[9] The 16 percent of filings mentioning either SPE or VIE is considerably smaller than the percentage of firms with SPVs according to our measure. However, prior to the Enron meltdown there was no specific requirement to disclose SPV activity and, hence, many firms that had SPVs did not discuss them in the 10-Ks. As examples, Enron and Dynegy, two firms clearly asserted by the SEC to have used SPVs to meet financial reporting objectives, did not directly mention their use of SPVs prior to the SEC litigation, although in both cases Exhibit 21 indicated multiple SPVs.

[10] In attempting this match, we lost 198 observations from the original set of 33,244. We repeat this validity check on 10-Ks filed after the Enron bankruptcy on December 2, 2001, when it is possible that firms began mentioning SPEs or VIEs to specifically state that they avoid using these types of off-balance sheet entities. While the percentage of firms mentioning SPEs/VIEs increases dramatically (from 11 percent in 2002 to 55 percent in 2004), about the same percentage (63.6 percent) of these firms list SPVs in Exhibit 21.

IV. EMPIRICAL MODEL OF SPV USE

To address our first research objective of examining the determinants of SPV use, we estimate regression models of the number of SPVs as a function of financial reporting motivations (*X*), economic motivations (*Y*), corporate governance variables (*Z*), and control variables (*V*). We estimate four models: model 1 contains only the financial reporting and control variables, whereas models 2 and 3 progressively add the economic and corporate governance variables; model 4 includes interactions between the financial reporting and corporate governance variables to capture the differential effects of corporate governance on financial reporting incentives. Given that the number of SPVs cannot be less than zero, our dependent variable is left-censored, so we use the Tobit specification instead of a linear regression model (Wooldridge 2001; Greene 2003).[11,12]

Our model including all three vectors of explanatory and control variables (model 3) is specified as follows (with subscripts *i* and *t* indexing firm and year, respectively):

$$SPV_{i,t}\begin{cases} = X_{i,t-1}'\beta + Y_{i,t-1}'\gamma + Z_{i,t-1}'\lambda + V_{i,t-1}'\kappa + \varepsilon_{i,t} \\ \qquad\qquad \text{if } X_{i,t-1}'\beta + Y_{i,t-1}'\gamma + Z_{i,t-1}'\lambda + V_{i,t-1}'\kappa + \varepsilon_{i,t} > 0 \\ = 0 \\ \qquad\qquad \text{if } X_{i,t-1}'\beta + Y_{i,t-1}'\gamma + Z_{i,t-1}'\lambda + V_{i,t-1}'\kappa + \varepsilon_{i,t} \leq 0 \end{cases} \quad (1)$$

where:

$$X_{i,t-1}'\beta = \alpha + \beta_1 LEV_{i,t-1} + \beta_2 INTCOV_{i,t-1} + \beta_3 BONUS_{i,t-1} + \beta_4 DEBTISS_{i,t+1} + \beta_5 STOCKISS_{i,t+1}$$

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[11] While many authors refer to settings such as ours as yielding "censored" data, Wooldridge (2001) clarifies that these are "corner solution" settings that, while different from censoring, are also appropriately analyzed using Tobit. In corner solution cases, economic agents are assumed to solve an optimization problem with a constraint that the solution is greater than or equal to zero, which results in data structures similar to censoring. Numerous studies in economics and accounting have used the Tobit model in corner solution settings. Examples include Tobin's (1958) seminal paper that introduced the Tobit model in which he analyzed household expenditures on durable goods, and Core and Guay's (1999) study of employee stock option grants.

[12] A limitation of Tobit is that it assumes that the same set of explanatory variables explains both the decision to initiate an SPV and the number of SPVs established. However, we have no reason to believe that the explanatory variables for the two decisions would be different. As an additional sensitivity test, we estimate a logit regression with a 0/1 dependent variable for the presence/absence of SPVs and the same set of explanatory variables. The results (not tabulated) are qualitatively similar to the Tobit regression results.

$$Y_{i,t-1}'\gamma = \gamma_1 RISK_{i,t-1} + \gamma_2 FUNDS_{i,t-1} + \gamma_3 CLTD_{i,t-1} + \gamma_4 MTR_{i,t-1} + \gamma_5 SETR_{i,t-1} + \gamma_6 INTANGIBLE_{i,t-1} + \gamma_7 FOREIGN_{i,t-1}$$

$$Z_{i,t-1}'\lambda = \lambda_1 DIRIND_{i,t-1} + \lambda_2 INDSH_{i,t-1} + \lambda_3 BUSY_{i,t-1}$$

$$V_{i,t-1}'\kappa = \kappa_1 LnSIZE_{i,t-1} + \kappa_2 INDU\_PERC_{i,t-1} + \sum_{j=3}^{j=10} \kappa_j YEAR\_DUM_{i,t-1}.$$

The financial reporting variables (*X*) include proxies for nearness to debt covenants (*LEV* and *INTCOV*), managerial compensation (*BONUS*), and external financing (*DEBTISS* and *STOCKISS*). The economic variables (*Y*) include proxies for firm risk (*RISK*), availability of funds (*FUNDS* and *CLTD*), and tax motivations (*MTR*, *SETR*, *INTANGIBLE*, and *FOREIGN*). The corporate governance variables (*Z*) include proxies for board characteristics (*DIRIND*, *INDSH*, and *BUSY*). Finally, the control variables (*V*) include firm size (*LnSIZE*), industry membership (*INDU_PERC*), and year effects (*YEAR_DUM*).

The variables are measured using financial reporting and stock return data from Compustat and CRSP for the years 1996 to 2004, managerial compensation data from ExecuComp, and corporate governance data from the Investor Responsibility Research Center, Inc. (IRRC) for 1996 to 2003. To mitigate endogeneity concerns, we use one-year lags for the explanatory variables (except *DEBTISS* and *STOCKISS*, which are measured at $t+1$ for the reasons given later). Table 3 summarizes the variable definitions. We discuss the motivation, definition, and predicted sign of each variable next.

Financial Reporting Determinants (*X* vector)

Debt covenants specify in accounting terms the minimum financial requirements necessary for a firm to avoid technical default in lending arrangements. Dichev and Skinner (2002) document large-sample evidence based on detailed debt terms reported in *DealScan* that (1) leverage is a noisy but statistically significant proxy for the tightness of debt covenant restrictions, consistent with evidence in Press and Weintrop (1990) and Duke and Hunt (1990), and (2) the interest coverage ratio is a commonly employed covenant. We proxy the closeness of firms to debt covenant restrictions with *LEV*, the ratio of total debt to total assets, and *INTCOV*, pre-interest operating income divided by interest expense. We expect SPV use to be increasing in *LEV* and decreasing in *INTCOV*.

The bonus plan hypothesis argues that managers adjust reported earnings when their compensation depends on performance contracts that are explicitly or implicitly based on reported earnings (Healy 1985; Ittner et al. 1997; Bushman and Smith 2001). Following Matsunaga and Park (2001) and Leone et al. (2006), we proxy earnings-based performance incentives with *BONUS*, defined as the ratio of the CEO's bonus to total cash compensation (salary plus bonus), and expect that firms' SPV sponsorship is increasing in *BONUS*. We examine the sensitivity of our results to alternate measures of *BONUS* that include stock-based compensation since Core et al. (2003) document that stock-based compensation provides a relatively large proportion of the CEO's incentives.[13]

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[13] Our stock-based compensation measures are: (1) the ratio of CEO's non-salary compensation to total compensation including cash and stock options, and (2) the ratio of CEO's stock options and shares owned to total number of shares outstanding, following Cheng and Warfield (2005). The regression results (not tabulated) when including the stock-based compensation are qualitatively similar to those based on *BONUS*.

TABLE 3
Variable Definitions

Panel A: Financial Reporting Variables

Construct	Variable	Definition (with Compustat Data Item in Parentheses, or other Data Source)	Predicted Sign
Contracting Incentives:			
Leverage	*LEV*	Total debt/total assets (#181/#6)	+
Interest Coverage Ratio	*INTCOV*	Operating income after depreciation (before interest) divided by interest expense (#178/#15)	–
Bonus Relative to Salary	*BONUS*	The ratio of CEO bonus to total cash compensation, sum of salary and bonus (ExecuComp database)	+
External Financing Needs:			
Net Issue of Debt	*DEBTISS*	The difference between long-term debt issuance and reduction divided by the average of total assets ([#111 – #114]/average #6)	+
Net Issue of Stock	*STOCKISS*	The difference between common and preferred stock sale and purchase divided by the average of total assets ([#108 – #115]/average #6)	+

Panel B: Economic Variables

Construct	Variable	Definition (with Compustat Data Item in Parentheses, or other Data Source)	Predicted Sign
Risk Clienteles:			
Stock Return Volatility	*RISK*	The decile of the standard deviation of daily stock returns for the year (CRSP database)	?
Availability of Funds:			
Internal Funds	*FUNDS*	Supply of internal funds, measured by the sum of cash flow from operating and cash flow from investing divided by average total assets ([#311 + #308]/average of #6),	–
Renegotiation Costs	*CLTD*	Long-term debt due within one year, measured by debt in current liabilities/total assets (#34/#6)	+
Tax Benefits:			
Marginal Tax Rate	*MTR*	Graham (1996) marginal tax rate based on simulated income before interest expense	+
State Effective Tax Rate	*SETR*	The sum of current and deferred state income tax expense divided by total pretax income ((#173 + #271)/#170)	+
Pct. of Intangible Assets	*INTANGIBLE*	The ratio of intangible assets to total assets (#33/#6)	+
Pct. of Foreign Income	*FOREIGN*	The ratio of foreign pretax income to total pretax income (#273/#170)	–

(*continued on next page*)

TABLE 3 (continued)

Panel C: Corporate Governance Variables

Construct	Variable	Definition (with Compustat Data Item in Parentheses, or other Data Source)	Predicted Sign
Independent Directors	*DIRIND*	% directors in the Board who are independent (IRRC database)	?
Stock Holdings of Independent Directors	*INDSH*	The percentage of stockholdings of independent directors (IRRC database)	?
Busy Directors	*BUSY*	% directors in the Board who serve on more than two other company boards (IRRC database)	?

Panel D: Control Variables

Construct	Variable	Definition (with Compustat Data Item in Parentheses, or other Data Source)	Predicted Sign
Firm Size	*LnSIZE*	Log sum of the market value of common shares and the book value of preferred stock and liabilities ([#25*#199] + #130 + #181)	+
Pct. of Firms Reporting SPVs Per Industry	*INDU_PERC*	Percent of firms reporting SPVs for each industry-year, where industry is the Fama-French (1997) industry classification	+

Dechow et al. (1996) find that, apart from the contracting motives, an important motivation for earnings management is the desire to attract external financing. Consistent with this notion, Teoh, Welch, and Wong (1998) and Teoh, Welch, and Rao (1998) find that firms issuing capital report unusually large positive accruals in the year preceding capital issuances. Following Dechow et al. (1996), we include *DEBTISS*, the net increase in debt, and *STOCKISS*, the value of net stock issuances (both deflated by average total assets). We measure both variables in year $t+1$ to capture firms' incentives to manage their financial statements prior to raising capital externally, and expect SPV use to increase in both variables.[14]

Economic Determinants (*Y* vector)

Sponsors may use SPVs to meet demands of certain risk clienteles by transferring an asset (or class of assets) with homogenized risks to an SPV that is legally isolated from the firm's general creditors. However, while some firms may transfer more-risky assets to SPVs to reduce investors' perception of the firm's risk, other firms may transfer less-risky assets to SPVs to raise capital from risk-averse investors who otherwise might avoid investing in the firm (Beatty et al. 1995). Hence, without making a directional prediction, we proxy management's desire to shift risky assets and liabilities to SPVs with *RISK* estimated by a two-step process following Beatty et al. (1995). We rank the standard deviations of all CRSP firms' daily stock returns into deciles (0/9 for the lowest/highest risk) and then assign each of our sample firms a value for *RISK* between 0 and 9 depending on which portfolio it fits.[15]

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[14] The creation of SPVs in year t may reduce the need for capital in year $t+1$ or make issuing debt more difficult in year $t+1$ since high-quality assets that can be used as collateral may have been transferred to the SPVs. However, if a firm still issues debt or equity in year $t+1$, this suggests that the firm had a strong desire to attract external financing in year t.

As described earlier, SPVs can enable firms to raise capital. We therefore predict that firms will employ SPVs when funds are tight and proxy fund availability with *FUNDS* and *CLTD,* following Beatty et al. (1995). *FUNDS* is the supply of internally generated funds, defined as the sum of cash flow from operations and investing activities divided by average total assets. *CLTD* is a measure of renegotiation costs, defined as long-term debt due within one year divided by total assets. We expect that SPV use is decreasing in *FUNDS* and increasing in *CLTD.*

Another reason for forming SPVs, especially using flow-through entities, is to allocate tax benefits (costs) to taxpayers who can most efficiently utilize (report) them. For example, synthetic leases, for which SPVs are widely used, receive capital lease treatment for tax purposes but operating lease treatment for financial reporting purposes. Because capital lease treatment results in greater tax benefits to lessees, firms with high marginal tax rates have stronger incentives to set up SPVs for synthetic leases. Consistent with this argument, Mills and Newberry (2005) find that firms with fewer net operating losses (higher marginal tax rates) report larger book-tax differences in interest expense. To capture the overall federal tax benefits, we include *MTR,* the marginal tax rate based on Graham's (1996) firm-specific simulation of the likelihood of incurring and utilizing net operating loss carryforwards. We use the before interest expense *MTR* because a decision to utilize off-balance-sheet debt financing is likely to involve shifting at least some existing debt, and expect its coefficient to be positive.[16]

In addition, as discussed before, SPVs are employed extensively in cross-jurisdictional tax planning, especially to garner state income tax benefits by shifting income derived from intangibles into low-tax states. Thus, we expect that the demand for such tax planning is greater among firms with higher state effective tax rates or with a larger proportion of intangible assets. We proxy state tax incentives with *SETR* (the state effective tax rate), defined as the sum of current and deferred state income tax expense divided by total pretax income, and *INTANGIBLE,* measured as intangible assets divided by total assets, and expect positive coefficients on both variables. Because firms' foreign activities provide alternative mechanisms for tax planning, we expect that SPV use is decreasing in firms' foreign presence. We capture foreign presence with *FOREIGN,* defined as the foreign pretax income divided by total pretax income, and expect its coefficient to be negative.

Corporate Governance Variables (Z vector)

Corporate governance has multiple dimensions. Larcker et al. (2007) investigate a broad set of corporate governance variables and find that only insider power and anti-takeover provisions are significantly associated with earnings management, measured as abnormal accruals. Since data on anti-takeover further reduces the sample size, we focus on three board characteristics designed to counteract insider power.

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[15] As a robustness check, we also measure *RISK* using cash flow volatility and credit risk. Cash flow volatility is defined as the standard deviation of operating cash flows scaled by total sales (#308/#12) over the previous four years, and credit risk is measured as the log of S&P credit rating (#280). The results with the two alternative measures are qualitatively similar to those based on *RISK.*

[16] Prior to the Tax Reform Act of 1986, firms with low marginal tax rates had incentives to form partnerships to share their losses with high marginal tax rate investors; Shevlin (1987) found evidence of this activity. However, after the 1986 Act limited the deductibility of losses from passive investments to the extent of passive income, Beatty et al. (1995) were able to find only mixed support for the negative tax rate argument.

First, the Business Roundtable (2002) and others (e.g., Lipton and Lorsch 1992) advise that sound governance necessitates that the majority of board members be independent of management because independent directors increase board monitoring effectiveness and better align shareholder and manager interests (e.g., Byrd and Hickman 1992; Brickley et al. 1994). We proxy board member independence with *DIRIND*, defined as the percentage of independent directors. Second, the Business Roundtable (2002) also suggests that independent directors should be "incentivized [sic] to focus on long-term stockholder value" by including firm equity as part of their compensation. Klein (1998) finds evidence of a positive relation between shareholder value and stock ownership by independent directors who serve on the investment and finance committees. To proxy these incentives, we include *INDSH*, the percent of voting common shares held by independent directors. Finally, directors serving on "too many" boards risk compromising their ability to perform well for any one of the boards (Business Roundtable 2002; Lipton and Lorsch 1992). Larcker et al. (2007) find that future performance (measured as return on assets) is lower among firms with busy directors. Thus, we include *BUSY*, defined as the percentage of directors serving on more than two other boards.

If board members can identify the purpose for setting up SPVs, we expect strong boards to discourage SPV use for financial reporting purposes but encourage SPV use for economic purposes. On the other hand, if board members cannot differentiate between these two purposes, it is not clear whether they would encourage or discourage SPV use. Whether board members can identify the different purposes for SPVs is an empirical question. Hence, we do not have directional predictions for *DIRIND*, *INDSH*, and *BUSY*, or for their interactions with the financial reporting variables.

Other Controls (*V* vector)

We also include controls for firm size, industry membership, and year effects. *LnSIZE* is the natural log of the sum of the market value of common equity and the book value of preferred equity and debt. As the SEC (2005, 2) notes, "SPEs are likely to be disproportionately concentrated in the very largest issuers," mainly because larger firms likely possess greater technical expertise to handle the complexity of structured finance arrangements and, hence, are more able to utilize SPVs as a means of raising capital. Thus, we predict a positive coefficient for *LnSIZE*. We control for industry membership with the variable *INDU_PERC*, defined as the percentage of firms with SPVs within each Fama and French (1997) industry category each year. To the extent SPV use is likely influenced by industry practices, we expect a positive coefficient. Finally, we include year dummies (*YEAR_DUM*) for each year in our sample to capture other systematic economy-wide effects varying over time.

V. RESULTS FOR THE DETERMINANTS OF SPV USE

Descriptive Statistics and Univariate Tests

Panel A of Table 4 presents univariate tests of differences in the explanatory variables between firms with and without SPVs. To mitigate the effect of outliers, we winsorize the bottom and top 1 percent of the distribution for all SPV determinant variables. Relative to firms without SPVs, firms reporting at least one SPV indicate higher leverage, lower interest coverage, and CEO bonuses that represent a greater portion of total cash compensation. In addition, firms with SPVs indicate lower stock return volatility, a greater proportion of debt due in the next year, higher marginal tax rates, greater intangible assets, and a lower proportion of foreign income than firms without SPVs. These differences are consistent with

TABLE 4
Descriptive Statistics and Univariate Tests

Panel A: Univariate Tests and Distribution of Explanatory Variables by Number of SPVs

Mean Median	SPV = 0 (1)	SPV > 0 (2)	Pred. Diff. (2) − (1)	Diff. Test	0 < SPV ≤ 4	4 < SPV ≤ 10	10 < SPV
Financial Reporting Variables (n = 3,885)							
LEV	0.552	0.618	+	9.72***	0.597	0.617	0.680
	0.558	0.619		8.47***	0.604	0.603	0.686
INTCOV	47.767	21.981	−	−1.36	25.734	25.470	8.010
	5.994	4.506		−5.47***	5.029	4.505	3.507
BONUS	0.348	0.387	+	4.88***	0.361	0.397	0.455
	0.380	0.428		4.28***	0.393	0.463	0.509
DEBTISS	0.013	0.012	+	−0.26	0.012	0.008	0.016
	0.000	0.000		0.15	0.000	−0.001	0.002
STOCKISS	−0.006	−0.007	+	−1.10	−0.008	−0.006	−0.008
	0.000	0.000		−1.31	0.000	0.000	0.000
Economic Variables (n = 3,660)							
RISK	2.967	2.548	?	−6.16***	2.695	2.444	2.185
	3.000	2.000		−5.04***	2.000	2.000	2.000
FUNDS	0.005	0.005	−	0.05	0.011	−0.007	0.000
	0.017	0.020		1.00	0.021	0.015	0.017
CLTD	0.039	0.048	+	4.11***	0.040	0.056	0.065
	0.018	0.021		1.99**	0.016	0.024	0.031
MTR	0.323	0.329	+	2.64***	0.327	0.327	0.336
	0.350	0.350		2.76***	0.350	0.350	0.350
SETR	0.030	0.030	+	0.41	0.029	0.029	0.032
	0.028	0.026		1.40	0.024	0.024	0.030
INTANGIBLE	0.099	0.132	+	6.74***	0.125	0.143	0.146
	0.038	0.076		6.91***	0.070	0.081	0.089
FOREIGN	0.179	0.145	−	−2.40**	0.158	0.145	0.103
	0.000	0.000		−2.70***	0.000	0.000	0.000

(continued on next page)

TABLE 4 (continued)

Mean Median	SPV = 0 (1)	SPV > 0 (2)	Pred. Diff. (2) − (1)	Diff. Test	0 < SPV ≤ 4	4 < SPV ≤ 10	10 < SPV
Corporate Governance Variables (n = 2,403)							
DIRIND	0.632	0.643	?	1.45	0.638	0.660	0.640
	0.667	0.667		1.58*	0.667	0.692	0.667
INDSH	0.009	0.010	?	0.86	0.014	0.008	0.003
	0.000	0.000		−1.01	0.000	0.000	0.000
BUSY	0.099	0.127	?	5.13***	0.114	0.130	0.165
	0.083	0.100		3.61***	0.091	0.100	0.125
Controls (n = 3,885)							
LnSIZE	7.679	8.409	+	14.36***	8.094	8.500	9.254
	7.504	8.241		11.51***	7.939	8.410	9.208
INDU_PERC	0.532	0.605	+	14.13***	0.589	0.619	0.642
	0.590	0.629		10.38***	0.622	0.636	0.685

Panel B: Pearson (Spearman) Correlation Coefficients above (below) the Diagonal

	SPV	*LEV*	*INT COV*	*BONUS*	*DEBT-ISS*	*STOCK-ISS*	*RISK*	*FUNDS*	*CLTD*	*MTR*	*SETR*	*INTANG.*	*FOREIGN*	*DIRIND*	*INDSH*	*BUSY*	*LnSIZE*	*INDU PERC*
SPV		**0.143**	−0.016	**0.113**	0.016	−0.001	**−0.085**	**−0.035**	**0.112**	**0.045**	0.008	0.023	**−0.068**	−0.004	**−0.049**	**0.101**	**0.216**	**0.185**
LEV	**0.200**		**−0.099**	**0.109**	**−0.040**	**0.066**	**−0.189**	**−0.082**	**0.277**	**−0.042**	**−0.038**	−0.020	−0.006	**0.192**	0.014	**0.209**	**0.335**	**0.254**
INTCOV	**−0.108**	**−0.468**		−0.016	−0.001	0.005	**0.053**	0.004	−0.030	0.023	0.004	−0.020	−0.011	**−0.047**	−0.005	−0.019	−0.012	0.014
BONUS	**0.113**	**0.117**	**0.204**		**0.079**	**−0.115**	**−0.198**	**0.035**	**0.090**	**0.128**	**0.058**	0.022	0.002	**0.054**	0.005	**0.087**	**0.302**	**0.106**
DEBT-ISS	0.025	−0.027	**0.112**	**0.101**		**−0.076**	**−0.050**	**−0.060**	**0.047**	−0.006	0.030	**−0.055**	−0.006	−0.026	0.015	−0.008	0.001	0.022
STOCK-ISS	−0.029	0.009	**−0.226**	**−0.136**	**−0.111**		**0.167**	**−0.234**	**0.034**	**−0.153**	**−0.062**	**−0.037**	0.007	0.027	−0.032	**−0.068**	**−0.157**	−0.030
RISK	**−0.120**	**−0.242**	**−0.107**	**−0.184**	**−0.103**	**0.175**		**−0.158**	**−0.094**	**−0.282**	−0.016	−0.011	−0.028	**−0.133**	**−0.041**	**−0.179**	**−0.354**	**−0.243**
FUNDS	−0.019	**−0.118**	**0.207**	**0.079**	**−0.045**	**−0.214**	**−0.131**		**−0.103**	**0.095**	0.006	**−0.078**	0.031	0.029	0.032	**0.045**	0.030	−0.022
CLTD	**0.075**	**0.297**	**−0.143**	**0.049**	0.005	−0.002	**−0.191**	**−0.069**		0.021	0.018	**−0.047**	**0.037**	**0.076**	0.004	**0.119**	**0.225**	**0.107**
MTR	**0.041**	**0.036**	**0.121**	**0.043**	−0.025	−0.006	**−0.141**	**0.069**	0.015		**0.080**	**0.041**	**0.041**	0.013	0.008	**0.066**	**0.146**	**0.069**
SETR	−0.025	**−0.088**	**0.162**	**0.103**	**0.042**	**−0.080**	−0.032	0.032	**0.041**	0.008		**0.052**	**−0.105**	−0.021	−0.026	0.008	−0.018	**0.058**
INTANG	**0.128**	0.009	0.003	0.031	**−0.109**	**−0.036**	−0.017	0.027	0.001	0.031	**0.100**		0.023	**−0.042**	**0.059**	0.015	−0.013	**−0.044**

(*continued on next page*)

TABLE 4 (continued)

	SPV	*LEV*	*INT COV*	*BONUS*	*DEBT-ISS*	*STOCK-ISS*	*RISK*	*FUNDS*	*CLTD*	*MTR*	*SETR*	*INTANG.*	*FOREIGN*	*DIRIND*	*INDSH*	*BUSY*	*LnSIZE*	*INDU PERC*
FOR_ EIGN	**−0.062**	**−0.040**	**0.129**	**0.060**	0.018	−0.030	**−0.082**	**0.096**	**0.108**	**0.056**	**−0.109**	**0.090**		0.032	0.020	0.010	**0.060**	**−0.112**
DIRIND	0.026	**0.213**	**−0.116**	**0.055**	−0.033	**0.040**	**−0.143**	0.019	**0.108**	**0.063**	−0.020	−0.010	**0.053**		**0.049**	**0.212**	**0.126**	**−0.046**
INDSH	**−0.042**	**−0.046**	−0.018	−0.021	**−0.054**	0.005	−0.030	0.021	−0.005	−0.004	−0.030	0.029	0.024	−0.004		−0.014	−0.026	0.010
BUSY	**0.115**	**0.232**	−0.023	**0.097**	−0.009	**−0.106**	**−0.194**	0.038	**0.131**	**0.061**	−0.001	0.036	**0.083**	**0.210**	**−0.086**		**0.450**	0.030
LnSIZE	**0.279**	**0.377**	0.028	**0.314**	**0.066**	**−0.172**	**−0.367**	0.010	**0.200**	**0.082**	**−0.036**	−0.012	**0.116**	**0.141**	**−0.122**	**0.454**		**0.093**
INDU_ PERC	**0.243**	**0.253**	**−0.181**	**0.104**	**0.058**	**−0.064**	**−0.217**	**−0.068**	**0.071**	**0.042**	**0.070**	**−0.099**	**−0.177**	−0.026	0.032	−0.001	**0.135**	

*, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively (two-tailed).

Panel A of this table reports univariate tests of differences in the means (t-tests) and medians (z-tests) of the explanatory variables between observations without any SPVs and those with at least one SPV. The panel also presents mean and median values for each variable classified by categories based on the number of SPVs.

Panel B of this table reports pair-wise correlations between the variables; bolded correlations are significant at the 5 percent level based on two-tailed critical values. The bottom and top 1 percent of the distribution for all variables are winsorized.

Table 3 provides variable definitions.

the argument that firms arrange SPVs for both financial reporting motivations and economic reasons. Among corporate governance variables, only the percentage of busy directors is significantly different between firms with and without SPVs. The last three columns of the table show the distribution of the explanatory variables by the number of SPVs for firms with SPVs. Of note, we find that *LEV* and *BONUS* (*INTCOV*) are monotonically increasing (decreasing) in the number of SPVs, consistent with firms having stronger financial reporting incentives setting up more SPVs.

Panel B of Table 4 reports Pearson (Spearman) correlation coefficients above (below) the diagonal. The magnitude of the correlations is generally less than 0.30, except some of the correlations between firm size and (1) *RISK* (−0.37), (2) *LEV* (0.38), and (3) *BONUS* (0.31). *LEV* and *INTCOV* are correlated at −0.47. These correlations suggest that multicollinearity is not a concern in our data.

Regression Results Explaining SPV Use

Table 5 presents the results of the four Tobit regression models of the determinants of SPV use. Each coefficient's significance level is determined using the one-tailed Chi-square statistic (two-tailed when the sign is not predicted). We control for heteroscedasticity and serial correlation in the number of SPVs within each firm using robust standard errors with clustering at the firm-level because Tobit models are particularly sensitive to these assumptions. All models have likelihood ratios significant at $p < .01$, indicating good overall explanatory power.

Model 1 examines only the variables designed to capture financial reporting incentives. The positive coefficient on *LEV* and negative coefficient on *INTCOV* support the debt covenant hypothesis; i.e., firms with greater leverage and lower interest coverage are more likely to use SPVs to circumvent binding debt covenants. The positive coefficient on *BONUS* is consistent with firms' SPV use increasing in the percentage of CEO cash compensation earned as a bonus. Finally, the positive coefficient on *DEBTISS* suggests increasing use of SPVs prior to raising external capital through debt, but *STOCKISS* is not significant in explaining SPV activity.

In model 2 we introduce the economic variables, but the sign and significance of the financial reporting variables do not change substantially. In terms of economic variables, *RISK* is not significant, similar to Beatty et al.'s (1995) results in the context of research and development partnerships. The coefficient on *FUNDS* is significantly negative, while the coefficient on *CLTD* is significantly positive, indicating that SPV use is greater among firms with low internal funds availability. Consistent with tax incentives, we observe that SPV use is increasing in *MTR* and *INTANGIBLE*, and decreasing in *FOREIGN*, although *SETR* is not significant.[17]

Model 3 includes the governance measures. We find that SPV use is decreasing in board independence (*DIRIND*) and independent directors' equity ownership (*INDSH*). *BUSY*, the proportion of directors serving on more than two other boards, is not significant in explaining SPVs. Model 4 adds the interactions between the financial reporting and

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[17] A limitation of the *INTANGIBLE* variable is that it captures only acquired intangibles (and not self-generated intangibles). Alternatively, R&D and advertising expense may better capture this idea. However, we found that a very large number of our sample firms have missing R&D and advertising expense. Specifically, of the 3,660 observations we use in model 2, 1,717 observations (47 percent) have missing R&D expense, and 2,689 (73 percent) have missing advertising expense. By contrast, only 1 observation has missing data on *INTANGIBLE*. When we estimate the results with R&D expense and advertising expense (coding the missing observations as zero) instead of *INTANGIBLE*, we obtain negative coefficients, which is contrary to the state tax-planning story. We suspect that the contrary results could be driven by the large number of missing observations for these variables that we coded as 0.

TABLE 5
Tobit Regression Results for Determinants of SPV Use

Variables	Pred. Sign	Model 1	Model 2	Model 3	Model 4
		Financial Reporting Variables (n = 3,885) Coefficient (z)	Model 1 plus Economic Variables (n = 3,660) Coefficient (z)	Model 2 plus Governance Variables (n = 2,403) Coefficient (z)	Model 3 plus Interactions of Financial Reporting and Governance Variables (n = 2,403) Coefficient (z)
Intercept		−62.05 (−17.71)	−65.33 (−14.40)	−57.33 (−10.44)	−56.12 (−9.66)
Financial Reporting Variables ($Y_{i,t-1}$)					
LEV (β_1)	+	5.15 (3.05)***	4.56 (2.51)***	8.49 (3.76)***	7.33 (2.58)***
INTCOV (β_2)	−	−0.00 (−1.62)*	−0.00 (−1.72)**	−0.00 (−2.02)**	−0.00 (−1.87)**
BONUS (β_3)	+	2.61 (1.55)*	2.69 (1.56)*	2.81 (1.38)*	3.42 (1.23)
DEBTISS (β_4)	+	10.81 (2.30)**	10.00 (2.11)**	5.43 (0.95)	−0.52 (−0.06)
STOCKISS (β_5)	+	0.41 (0.06)	−5.15 (−0.67)	−11.31 (−1.14)	−12.55 (−1.01)
Economic Variables ($X_{i,t-1}$)					
RISK (γ_1)	?		0.14 (0.64)	0.24 (0.84)	0.25 (0.89)
FUNDS (γ_2)	−		−6.27 (−1.82)**	−5.83 (−1.24)	−6.01 (−1.27)
CLTD (γ_3)	+		9.47 (1.49)*	11.86 (1.56)*	11.57 (1.53)*
MTR (γ_4)	+		12.37 (2.40)***	10.93 (1.75)**	11.33 (1.81)**
SETR (γ_5)	+		−4.44 (−0.60)	5.03 (0.56)	5.27 (0.59)
INTANGIBLE (γ_6)	+		8.40 (3.52)***	8.84 (3.21)***	8.86 (3.21)***
FOREIGN (γ_7)	−		−3.71 (−4.96)***	−3.70 (−4.37)***	−3.70 (−4.36)***
Governance Variables ($Z_{i,t-1}$)					
DIRIND (λ_1)	?			−6.16 (−2.48)**	−8.25 (−2.01)**
INDSII (λ_2)	?			−18.83 (−3.22)***	−19.35 (−3.28)**
BUSY (λ_3)	?			2.73 (0.73)	2.62 (0.70)
Financial Reporting Variables ($Y_{i,t-1}$) * Governance Variables					
*LEV * IND*	?				2.13 (0.69)
*BONUS * IND*	?				−1.04 (−0.28)
*DEBTISS * IND*	?				11.72 (1.00)
*STOCKISS * IND*	?				2.11 (0.11)

(*continued on next page*)

TABLE 5 (continued)

Variables	Pred. Sign	Model 1 Financial Reporting Variables (n = 3,885) Coefficient (z)	Model 2 Model 1 plus Economic Variables (n = 3,660) Coefficient (z)	Model 3 Model 2 plus Governance Variables (n = 2,403) Coefficient (z)	Model 4 Model 3 plus Interactions of Financial Reporting and Governance Variables (n = 2,403) Coefficient (z)
Control Variables ($V_{i,t-1}$)					
LnSIZE (κ_1)	+	3.40 (12.49)***	3.38 (11.63)***	3.08 (8.94)***	3.07 (8.95)***
INDU_PERC (κ_2)	+	32.95 (12.28)***	31.64 (11.41)***	29.01 (9.11)***	28.94 (9.12)***
Number (percentage) of Obs. with Positive SPVs		2,152 (55.4%)	2,003 (54.7%)	1,459 (60.7%)	1,459 (60.7%)
Likelihood Ratio		333.61	323.76	217.89	220.06

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*, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively (one-tailed), except when the sign is not predicted (two-tailed).
Table 5 reports Tobit regression results for determinants of SPV use after controlling for heteroscedasticity and autocorrelation in variations of this model:

$$SPV_{i,t}\begin{cases} = X_{i,t-1}'\beta + Y_{i,t-1}'\gamma + Z_{i,t-1}'\lambda + V_{i,t-1}'\kappa + \varepsilon_{i,t} & \text{if } X_{i,t-1}'\beta + Y_{i,t-1}'\gamma + Z_{i,t-1}'\lambda + V_{i,t-1}'\kappa + \varepsilon_{i,t} > 0 \\ = 0 & \text{if } X_{i,t-1}'\beta + Y_{i,t-1}'\gamma + Z_{i,t-1}'\lambda + V_{i,t-1}'\kappa + \varepsilon_{i,t} \leq 0 \end{cases}$$

where X, Y, Z, and V are vectors of financial reporting, economic, governance, and control variables, respectively:

$$X_{i,t-1}'\beta = \alpha + \beta_1 LEV_{i,t-1} + \beta_2 INTCOV_{i,t-1} + \beta_3 BONUS_{i,t-1} + \beta_4 DEBTISS_{i,t+1} + \beta_5 STOCKISS_{i,t+1}$$

$$Y_{i,t-1}'\gamma = \gamma_1 RISK_{i,t-1} + \gamma_2 FUNDS_{i,t-1} + \gamma_3 CLTD_{i,t-1} + \gamma_4 MTR_{i,t-1} + \gamma_5 SETR_{i,t-1} + \gamma_6 INTANGIBLE_{i,t-1} + \gamma_7 FOREIGN_{i,t-1}$$

$$Z_{i,t-1}'\lambda = \lambda_1 DIRIND_{i,t-1} + \lambda_2 INDSH_{i,t-1} + \lambda_3 BUSY_{i,t-1}$$

$$V_{i,t-1}'\kappa = \kappa_1 LnSIZE_{i,t-1} + \kappa_2 INDU\_PERC_{i,t-1} + \sum_{j=3}^{j=10} \kappa_j YEAR\_DUM_{i,t-1}$$

Model 1 includes only financial reporting variables, while models 2, 3, and 4 progressively add economic variables, corporate governance variables, and interactions of financial reporting and independent director dummy variables. Variables are defined in Table 3 except that in model 4 *IND* is 1 if *DIRIND* is greater than the median *DIRIND* value, and 0 otherwise. The bottom and top 1 percent of the distribution for all variables are winsorized. Each model is estimated with all observations for which data are available to calculate the variables in that model. The model's likelihood ratio is calculated as 2(L1 − L0), where L0 and L1 are the constant-only and full model log-likelihoods, respectively. Each coefficient's significance level is determined using the one-tailed likelihood ratio Chi-square statistic (two-tailed when the sign is not predicted) that is calculated using robust standard errors with clustering at the firm-level that control for heteroscedasticity and serial correlation in the number of SPVs within each firm. The intercept in all models is significantly negative at the 1 percent level.

governance variables. We capture governance using *IND*, a binary variable coded 1 if *DIRIND* is at least equal to the median value of *DIRIND*, and 0 otherwise. None of the interactions are significant.[18] Overall, it appears that boards of firms with strong corporate governance discourage the formation of SPVs, possibly because they are unable to distinguish SPVs formed for financial reporting purposes from SPVs formed for other reasons. With respect to the financial reporting and economic variables, the results in models 3 and 4 are generally similar to models 1 and 2, except that *DEBTISS* and *FUNDS* become insignificant.

The control variables *LnSIZE*, *INDU_PERC*, and *YEAR_DUM* (*YEAR_DUM* not tabulated) are positive and significant in all models ($p < .01$). These results indicate that SPV use is more prevalent among larger firms, influenced by industry practices, and increasing over the 1997–2003 period.

To evaluate the economic significance of the Tobit results, we calculate the change in the expected number of SPVs when independent variables increase from the first to the third quartile in models 2 and 3. Specifically, when *LEV* and *BONUS* increase from the first to the third quartile in model 2 (model 3), the expected SPVs increase by 0.66 (1.31) and 0.57 (0.73), respectively. Similarly, an inter-quartile increase in *FUNDS* decreases expected SPVs by 0.37 (0.36) in model 2 (model 3), while an inter-quartile increase in *INTANGIBLE* increases expected SPVs by 0.83 (1.05) in model 2 (model 3). With respect to governance, an inter-quartile increase in *DIRIND* results in a decrease of expected SPVs by 1.04 in model 3. The magnitude effects of these variables on the expected number of SPVs are substantial, given that more than 70 percent of our sample observations have zero or one SPV.

To investigate the robustness of the Tobit model results, we conduct a battery of sensitivity tests related to model specification, definitions of the dependent and independent variables, and sample selection. First, given the sensitivity of the Tobit model to various assumptions, we estimate our results using alternative model specifications, such as logit and OLS. In addition, we use maximum likelihood estimators assuming a negative binomial or a lognormal distribution of the SPV count variable. These estimators help mitigate concerns about violating the normality assumption of the dependent variable to which Tobit models are sensitive. The results of these alternative model specifications (not tabulated) are qualitatively similar to the Tobit results presented in Table 5.

Second, our descriptive statistics (Table 2, Panel A) show that the use of LLCs has increased significantly from 1997 to 2004. Given the "check-the-box" rules discussed earlier and extant research (e.g., Fox and Luna 2005), it is likely that LLCs are more closely tied to the tax motivation. Hence, we reran the Tobit models excluding LLCs. The results for models 1 and 2 are qualitatively similar but, in model 3, the coefficient on *INDSH* becomes insignificant. Similarly, there has been much discussion in the popular press about the use of trusts, especially real estate investment trusts (REITs), in multistate tax planning.[19] Thus, like LLCs, it is likely that such entities are more closely tied to the tax motivation. Hence, we re-estimated the Tobit models excluding REITs and our results are qualitatively unchanged.

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[18] We also use the continuous *DIRIND* in the interaction with no substantive change in the results. In addition, we examine alternative specifications of the interaction using variables similarly constructed with *INDSH* and *BUSY*. These interactions are generally not significant except that the interaction of the binary version of *BUSY* with *BONUS* and *DEBTISS* generates positive and significant coefficients ($p < .10$ and $p < .05$, respectively, two-tailed).

[19] For example, Wal-Mart's state tax-planning strategy involves a Wal-Mart subsidiary paying rent to a captive REIT that is 99 percent owned by another subsidiary of the company and its employees (Drucker 2007). The rent is deducted in computing state tax expense whereas the dividend from the REIT to the other subsidiary is tax-free, thereby reducing Wal-Mart's state income tax expense substantially.

Third, to evaluate the sensitivity of the results to various definitional choices of the independent variables, we re-estimated the Tobit models with (1) the inclusion of stock-based compensation in the *BONUS* variable, (2) the use of cash flow volatility and S&P credit rating to measure firm risk, (3) the use of a continuous *DIRIND* variable instead of a 0/1 dummy (*IND*) to interact with financial reporting variables, and (4) the introduction of a control for business complexity using industry and geographic segment data following Frankel et al. (2006). The results (not tabulated) are qualitatively similar to the Table 5 results.

Finally, because of the lack of electronic filing in the earlier years, we had deleted data from 1994 to 1996. Our results continue to hold when we change our sample selection criteria to include those years.

In summary, our Tobit regression results document that SPV activity increases with financial reporting incentives and economic and tax motivations, but strong corporate governance tends to mitigate their use. These results are robust to a number of sensitivity tests.

VI. EARNINGS MANAGEMENT TESTS AND RESULTS

To address our second research objective of examining the role of SPVs in earnings management, we use the Tobit results of model 2 to parse the number of SPVs for each firm-year into those predicted by financial reporting (*Pred_fin*), economic (*Pred_eco*), and control (*Pred_ctr*) variables, adapting an approach used by Hanlon et al. (2003).[20] Because SPVs formed for financial reporting objectives are more likely related to earnings management than SPVs formed for other reasons, we hypothesize that *Pred_fin*, but not *Pred_eco* or *Pred_ctr*, is positively associated with the earnings management measures.

As described in Section II, SPVs can be used to manage earnings either through accruals or through cash flows. Hence, we examine the effect of SPVs on (1) accruals by considering discretionary and performance-matched accruals (Jones 1991; Kothari et al. 2005), and (2) overall earnings using small gains versus small losses tests (Hayn 1995; Burgstahler and Dichev 1997).[21,22] A potential advantage of using an SPV to avoid losses is that final numbers from SPV arrangements can be determined at the end of a fiscal period, just in time to reach an earnings target (Dechow and Shakespeare 2009).

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[20] We use model 2 because additional data requirements for governance variables in models 3 and 4 reduce the sample size by one-third. In sensitivity tests, we find that the associations between SPVs driven by financial reporting incentives and earnings management variables remain positive when we use the Tobit results of model 3. We do not employ model 4 because none of the interactions between the financial reporting and corporate governance variables is significant.

[21] We do not consider the effects of SPVs on cash flows directly because they are more volatile than earnings (Dechow 1994), and no reliable method has been developed to estimate "normal" (and thus abnormal) cash flows.

[22] In addition to reporting positive profits, managers have incentives to reach two other earnings thresholds: prior-year earnings and analysts' consensus forecasts. However, the prior-year earnings threshold is dominated by the positive profits threshold in a hierarchy of earnings management objectives (Degeorge et al. 1999). Further, managers can meet or beat analyst forecasts through a combination of earnings management and forecast guidance (Matsumoto 2002; Cotter et al. 2006), which makes meeting analyst forecasts a noisy measure of earnings management. Consistent with our argument, we do not find significant correlations between the number of SPVs and the two other earnings thresholds.

Computing Predicted SPVs for Financial Reporting and Economic Reasons

The predicted number of SPVs under the Tobit model is as follows:

$$\hat{SPV}_{i,t} = (X_{i,t-1}'\hat{\beta} + Y_{i,t-1}'\hat{\gamma} + V_{i,t-1}'\hat{\kappa} + \hat{\sigma}\lambda_{i,t-1}) \times \Phi\left(\frac{X_{i,t-1}'\hat{\beta} + Y_{i,t-1}'\hat{\gamma} + V_{i,t-1}'\hat{\kappa}}{\hat{\sigma}}\right), \tag{2}$$

where $\hat{\beta}$, $\hat{\gamma}$, and $\hat{\kappa}$ are the estimated coefficients from model 2 in Table 5; $\hat{\sigma}$ is the estimated standard deviation of the error term, ε; and λ is the ratio of the standard normal probability density, $\phi\left(\frac{X_{i,t-1}'\hat{\beta} + Y_{i,t-1}'\hat{\gamma} + V_{i,t-1}'\hat{\kappa}}{\hat{\sigma}}\right)$, to the cumulative density, $\Phi\left(\frac{X_{i,t-1}'\hat{\beta} + Y_{i,t-1}'\hat{\gamma} + V_{i,t-1}'\hat{\kappa}}{\hat{\sigma}}\right)$.

We decompose the predicted number of SPVs into *Pred_fin*, *Pred_eco*, *Pred_ctr*, and *Pred_err* for each firm-year as follows:

$$Pred\_fin = X_{i,t-1}'\hat{\beta}\Phi\left(\frac{X_{i,t-1}'\hat{\beta} + Y_{i,t-1}'\hat{\gamma} + V_{i,t-1}'\hat{\kappa}}{\hat{\sigma}}\right), \tag{3}$$

$$Pred\_eco = Y_{i,t-1}'\hat{\gamma}\Phi\left(\frac{X_{i,t-1}'\hat{\beta} + Y_{i,t-1}'\hat{\gamma} + V_{i,t-1}'\hat{\kappa}}{\hat{\sigma}}\right), \tag{4}$$

$$Pred\_ctr = V_{i,t-1}'\hat{\kappa}\Phi\left(\frac{X_{i,t-1}'\hat{\beta} + Y_{i,t-1}'\hat{\gamma} + V_{i,t-1}'\hat{\kappa}}{\hat{\sigma}}\right), \text{ and} \tag{5}$$

$$Pred\_err = \hat{\sigma}\lambda_{i,t-1}\Phi\left(\frac{X_{i,t-1}'\hat{\beta} + Y_{i,t-1}'\hat{\gamma} + V_{i,t-1}'\hat{\kappa}}{\hat{\sigma}}\right), \tag{6}$$

where $X_{i,t-1}'\hat{\beta}$, $Y_{i,t-1}'\hat{\gamma}$, and $V_{i,t-1}'\hat{\kappa}$ are the non-censored predicted components of SPVs related to the financial reporting determinants, the economic determinants, and control variables, respectively.[23] *Pred_err* represents the expected value of the error term. Unlike OLS the expected value of the Tobit error is positive due to data censoring.[24]

Measures of Earnings Management

Accruals

We use two accrual measures: *Discretionary Accruals* and *Performance-Matched Discretionary Accruals. Discretionary Accruals* are estimated as residuals from the following cross-sectional modified Jones (1991) model (see DeFond and Subramanyam 1998):

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[23] *LEV* (*CLTD*) is classified as a financial reporting (economic) motivation for forming an SPV, although it could potentially capture a(n) economic (financial) motivation. This dual nature of *LEV* and *CLTD* adds noise to both *Pred_fin* and *Pred_eco*, reducing the power of our earnings management tests. To check whether earnings management results depend on these classifications, we (1) reclassify *LEV* as an economic determinant, and (2) reclassify *CLTD* as a financial reporting determinant. Under the alternative classifications, *Pred_fin* continues to be significantly positively associated with all earnings management measures. On the other hand, *Pred_eco* and *Pred_ctr* are generally not significantly associated with earnings management measures.

[24] We do not consider the Tobit model residual because it is not well defined. To consider the effect of the residual on earnings management results, we use OLS regressions with the log number of SPVs as the dependent variable to decompose the number of SPVs into *Pred_fin*, *Pred_eco*, *Pred_ctr*, and the residual, strictly following Hanlon et al. (2003). The results of the OLS-based earnings management tests are similar to those obtained with the Tobit models.

$$TA_{i,t} = \alpha + \beta_1(\Delta Sales_{i,t} - \Delta REC_{i,t}) + \beta_2 PPE_{i,t} + \varepsilon_{i,t} \tag{7}$$

where *TA* is total accruals, defined as income before extraordinary items minus cash flows from operating activities; $\Delta Sales$ is the change in sales from the previous year to the current year; ΔREC is the change in accounts receivable from the beginning to the end of the year; and *PPE* is the end-of-year gross property, plant, and equipment. All variables are scaled by the beginning-of-year total assets.

Performance-Matched Discretionary Accruals are based on a control sample approach that mitigates problems of model misspecification and self-selection inherent in studies of earnings management (Kothari et al. 2005), including ours. Specifically, we estimate *Performance-Matched Discretionary Accruals* as the difference between a sample firm's discretionary accruals per the modified Jones model estimated above and the discretionary accruals of a control firm matched on industry, year, size, and performance (i.e., *ROA*).

Frequency of Small Profits Relative to Small Losses

"Small profits" and "small losses" are measured based on earnings scaled by total assets at the beginning of the period (Leuz et al. 2003). Earnings are alternatively defined as net income or income before extraordinary items. Following Dechow et al. (2003), small losses are defined to be greater than or equal to −0.01 but less than 0 and small profits are defined to be greater than or equal to 0 but less than or equal to 0.01. A dummy variable, *ROAPOS1* (*ROAPOS2*), equals 1 if a company reports small profits based on net income (income before extraordinary items), and 0 if a company reports small losses.

Empirical Results for Effects of SPVs on Accruals and Small Profits or Losses

Panel A of Table 6 provides descriptive statistics for the number of SPVs (actual and predicted) and the earnings management measures.[25] Both mean and median *Pred_fin* and *Pred_eco* are positive, consistent with the argument that companies set up SPVs for both economic and financial reporting reasons. The mean and median *Pred_ctr* and *Pred_err* are also positive but large, and potentially offset by the large negative intercept in model 2. Both mean and median *Total Accruals* are negative, largely due to the negative effect of depreciation on accruals. On the other hand, the mean and median of *Discretionary Accruals* and *Performance-Matched Discretionary Accruals* are fairly close to 0, consistent with their residual nature. The mean of both *ROAPOS1* and *ROAPOS2* is greater than 0.5, indicating firms have incentives to avoid losses (Burgstahler and Dichev 1997). The last four columns compare the earnings management measures between firms with and without SPVs. The mean and median predicted SPVs are significantly greater for firms indicating positive SPVs than for firms reporting no SPVs. On the other hand, there is generally no significant difference in the earnings management measures between the two subgroups. This result is not surprising, given that only SPVs created for financial reporting reasons are expected to be used to manage earnings.

Panel B of Table 6 reports the correlations between the number of SPVs and the accrual measures. For all firm-year observations (columns 1 to 3), the number of SPVs is positively correlated with *Total Accruals*, but not with either *Discretionary Accruals* or *Performance-Matched Discretionary Accruals*, consistent with the results in Panel A. On the other hand,

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[25] Because of potential concerns with estimating discretionary accrual models for the financial and regulated industries, we excluded those industries in the accrual tests, but included them in the small profits tests.

TABLE 6
Distribution of SPVs (Actual and Predicted) and Earnings Management Measures and their Correlations with Actual and Predicted SPVs

Panel A: Distribution of Earnings Management Measures

					Firm-Years where the Number of SPVs = 0		Firm-Years where the Number of SPVs > 0	
	n	**Mean**	**STD**	**Median**	**Mean**	**Median**	**Mean**	**Median**
SPVs								
Number of SPVs	2,872	3.877	10.933	1	0	0	7.453***	3***
Pred_fin	2,872	1.574	1.103	1.361	1.257	1.024	1.867***	1.653***
Pred_eco	2,872	2.152	1.611	1.881	1.692	1.439	2.576***	2.287***
Pred_ctr	2,872	22.441	13.242	20.335	17.556	15.218	26.946***	25.244***
Pred_err	2,872	6.890	1.247	7.377	6.530	6.981	7.222***	7.584***
Accruals								
Total Accruals	2,872	−0.069	0.092	−0.060	−0.067	−0.056	−0.071	−0.062**
Discretionary Accruals	2,872	−0.011	0.086	−0.006	−0.012	−0.005	−0.010	−0.006
Performance-Matched Discretionary Accruals	2,566	−0.008	0.107	−0.004	−0.008	−0.004	−0.008	−0.004
Small Gains/Small Losses								
ROAPOS1	268	0.638	0.481	1	0.593	1	0.671	1
ROAPOS2	291	0.656	0.476	1	0.605	1	0.692	1

(*continued on next page*)

TABLE 6 (continued)

Panel B: Pearson Correlations between SPVs (Actual and Predicted) and Accruals

	All Firm-Years			Firm-Years where the Number of SPVs = 0			Firm-Years where the Number of SPVs > 0		
Pearson Correlation (two-tailed p-value)	*Total Accruals* (n = 2,872) (1)	*Discretionary Accruals* (n = 2,872) (2)	*Performance-Matched Discretionary Accruals* (n = 2,566) (3)	*Total Accruals* (n = 1,378) (4)	*Discretionary Accruals* (n = 1,378) (5)	*Performance-Matched Discretionary Accruals* (n = 1,267) (6)	*Total Accruals* (n = 1,494) (7)	*Discretionary Accruals* (n = 1,494) (8)	*Performance-Matched Discretionary Accruals* (n = 1,299) (9)
Number of SPVs	0.035*	−0.001	0.002	NA	NA	NA	0.064**	−0.005	0.004
	(0.060)	(0.975)	(0.922)				(0.013)	(0.847)	(0.897)
Pred_fin	0.060***	0.053***	0.018	0.052*	0.044	0.006	0.082***	0.061**	0.031*
	(0.001)	(0.005)	(0.368)	(0.053)	(0.102)	(0.832)	(0.002)	(0.018)	(0.070)
Pred_eco	0.023	−0.026	−0.016	0.030	−0.016	−0.012	0.030	−0.041	−0.020
	(0.223)	(0.162)	(0.424)	(0.272)	(0.558)	(0.671)	(0.240)	(0.114)	(0.467)
Pred_ctr	0.000	0.029	0.002	0.018	0.036	0.008	−0.001	0.021	−0.002
	(0.999)	(0.123)	(0.922)	(0.494)	(0.185)	(0.785)	(0.980)	(0.418)	(0.932)
Pred_err	−0.019	0.007	0.001	−0.010	0.004	−0.002	−0.019	0.008	0.009
	(0.316)	(0.694)	(0.932)	(0.707)	(0.891)	(0.950)	(0.469)	(0.749)	(0.753)

Panel C: Pearson Correlations between SPVs (Actual and Predicted) and Small Gains/Small Losses

	All Firm-Years		Firm-Years where the Number of SPVs = 0		Firm-Years where the Number of SPVs > 0	
Pearson Correlation (two-tailed p-value)	*ROAPOS1* (n = 268) (1)	*ROAPOS2* (n = 291) (2)	*ROAPOS* (n = 113) (3)	*ROAPOS2* (n = 119) (4)	*ROAPOS1* (n = 155) (5)	*ROAPOS2* (n = 172) (6)
Number of SPVs	0.072	0.088	NA	NA	0.060	0.079
	(0.239)	(0.135)			(0.461)	(0.303)
Pred_fin	0.207***	0.174***	0.111	0.128	0.239***	0.170**
	(0.001)	(0.003)	(0.243)	(0.165)	(0.003)	(0.026)
Pred_eco	0.098	0.086	0.089	0.070	0.080	0.061
	(0.108)	(0.143)	(0.348)	(0.450)	(0.322)	(0.424)

(continued on next page)

TABLE 6 (continued)

Pearson Correlation (two-tailed p-value)	All Firm-Years		Firm-Years where the Number of SPVs = 0		Firm-Years where the Number of SPVs > 0	
	ROAPOS1 (n = 268)	*ROAPOS2* (n = 291)	*ROAPOS* (n = 113)	*ROAPOS2* (n = 119)	*ROAPOS1* (n = 155)	*ROAPOS2* (n = 172)
Pred_ctr	0.153**	0.142**	0.101	0.112	0.154*	0.121
	(0.012)	(0.015)	(0.289)	(0.226)	(0.055)	(0.115)
Pred_err	−0.109*	−0.142**	−0.041	−0.106	−0.170**	−0.175**
	(0.074)	(0.015)	(0.663)	(0.252)	(0.034)	(0.021)

Panel A: *, **, *** Indicate significant differences between firm-years with SPVs and firm-years without SPVs at the 10 percent, 5 percent, and 1 percent levels, respectively (two-tailed).

Panels B and C: *, **, *** Indicate correlation significance at the 10 percent, 5 percent, and 1 percent levels, respectively (two-tailed).

This table reports distribution of the number of SPVs and earnings management measures (Panel A) and Pearson correlations between five measures of the number of SPVs and two sets of earnings management measures (Panel B and C). The two sets of earnings management measures are accruals (*Discretionary Accruals* and *Performance-Matched Discretionary Accruals*) and frequency of small gains/small losses (*ROAPOS1* and *ROAPOS2*). *Discretionary Accruals* are residuals from applying the Modified Jones model coefficients for the appropriate year and industry. The Modified Jones model, $TA_{i,t} = \alpha + \beta_1(\Delta Sales_{i,t} - \Delta REC_{i,t}) + \beta_2 PPE_{i,t} + \varepsilon_{i,t}$, is estimated across all Compustat firms by year and by industry, where *TA* (*Total Accruals*) is income before extraordinary items (#123) minus cash flows from operating activities (#308), scaled by beginning total assets (#6), and sales, receivables, and PPE are Compustat items #12, #2 and #8, respectively. *Performance-Matched Discretionary Accruals* are estimated from out-of-sample control firms matched on year, industry, return on assets, and firm size. *ROAPOS1* [*ROAPOS2*] is 1 if a company reports small profits based on net income (#172) [income before extraordinary items (#18)], and 0 if a company reports small losses. The five SPV measures are: (1) the actual number of SPVs, (2) the number of SPVs predicted by financial reporting variables (*Pred_fin*), (3) the number of SPVs predicted by economic variables (*Pred_eco*), (4) the number of SPVs predicted by control variables (*Pred_ctr*), and (5) the predicted value of the error (*Pred_err*).

consistent with our prediction that SPVs arranged for financial reporting purposes are used to manage earnings upward, *Pred_fin* is significantly positively correlated with *Discretionary Accruals,* but not with *Performance-Matched Discretionary Accruals.* Finally, *Pred_eco, Pred_ctr,* and *Pred_err* are not significantly correlated with any of the accrual measures.

As specified, *Pred_fin* is a function of the firm's leverage ratio, interest coverage ratio, CEO bonus, and debt and stock issuances of the previous year, all of which are related to managers' incentive to manage earnings. Thus, the observed positive correlations of *Pred_fin* with the accrual measures could be caused by conventional earnings management variables instead of by SPVs. To test for this possibility, we subdivide the sample into two groups: one with zero SPVs and the other with positive SPVs. If SPVs are not used to manage earnings, then we should observe similar positive correlations for both groups. On the other hand, if SPVs are used to manage earnings upward, then we should observe positive correlations between *Pred_fin* and the accrual measures only for firms with positive SPVs.

Columns 4 to 9 in Panel B of Table 6 report our correlation results for the two groups of sample firms. For firms without SPVs (columns 4 to 6), *Pred_fin* is not significantly related to either *Discretionary Accruals* or *Performance-Matched Discretionary Accruals.* However, for firms reporting at least one SPV (columns 7 to 9), *Pred_fin* is significantly positively correlated with both *Discretionary Accruals* and with *Performance-Matched Discretionary Accruals.* In contrast, *Pred_eco, Pred_ctr,* and *Pred_err* are not significantly correlated with accrual measures in either group (with or without SPVs). These results are consistent with the argument that only *Pred_fin* is used to manage accruals upward.

Panel C of Table 6 reports the Pearson correlations between SPVs and the likelihood of small profits. Columns 1 and 2 indicate correlations based upon all firm-year observations. While the number of SPVs is not significantly correlated with either *ROAPOS1* or *ROAPOS2*, the correlations of *Pred_fin* with *ROAPOS1* and *ROAPOS2* are 0.207 and 0.174, respectively, which are both significant at $p < .01$. The correlations of *Pred_eco* with *ROAPOS1* and *ROAPOS2* are not significant. The correlations of *Pred_ctr* with *ROAPOS1* and *ROAPOS2* are also positive (0.153 and 0.142, respectively), although the magnitude and significance are smaller than for *Pred_fin.* Finally, *Pred_err* is negatively correlated with the ROA measures, perhaps because of the negative correlation between *Pred_err* and *Pred_fin.*

Similar to Panel B of Table 6, we divide the sample of small profits and losses firm-years into two groups: one without SPVs and the other with SPVs. For firms without SPVs (columns 3 and 4), none of the correlations of *Pred_fin, Pred_eco, Pred_ctr,* and *Pred_err* with *ROAPOS1* or *ROAPOS2* are significant. For firms with SPVs (columns 5 and 6), *Pred_fin* is positively correlated with both *ROAPOS1* and *ROAPOS2* (0.239, $p < .01$ and 0.170, $p < .05$, respectively). In contrast, *Pred_eco* is not correlated with either measure; *Pred_ctr* is only marginally correlated with *ROAPOS1*; and *Pred_err* is negatively correlated with both ROA measures.

In conclusion, we find that SPVs formed for financial reporting purposes are positively related to earnings management measures, whereas SPVs formed for economic and other reasons do not exhibit such consistent positive correlations. Further, the positive correlations between *Pred_fin* and our earnings management measures are concentrated within firms that report SPVs. This latter observation diminishes the potential explanation that the positive correlations we observe are mechanically driven by traditional earnings management variables that explain *Pred_fin.*

As additional tests, we also estimate the marginal effect of *Pred_fin*, *Pred_eco*, *Pred_ctr*, and *Pred_err* using variations of the following regression model:

$$\begin{aligned} \textit{Earnings Management}_{i,t} = {} & \alpha + \beta_1 \textit{Pred\_fin}_{i,t} + \beta_2 \textit{Pred\_eco}_{i,t} \\ & + \beta_3 \textit{Pred\_ctr}_{i,t} + \beta_4 \textit{Pred\_err}_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{8}$$

where *Earnings Management* is one of the four earnings management measures: *Discretionary Accruals*, *Performance-Matched Discretionary Accruals*, *ROAPOS1*, or *ROAPOS2*. If companies use *Pred_fin* to manage earnings, we expect β_1 to be significantly positive.

Table 7 reports the regression results using only firm-years with SPVs. Panel A presents the OLS regression results of accruals. β_1 is positive and significant in both the *Discretionary Accruals* and *Performance-Matched Discretionary Accruals* models. On average, when *Pred_fin* increases by 1, *Discretionary Accruals* and *Performance-Matched Discretionary Accruals* increase by 0.0088 and 0.0075, respectively. This magnitude is quite large given that the mean *Discretionary Accruals* and *Performance-Matched Discretionary Accruals* are only −0.011 and −0.008, respectively. On the other hand, β_2, β_3, and β_4 are not significantly positively associated with accruals in either model.[26]

Panel B of Table 7 reports the logistic regression results of *ROAPOS1* and *ROAPOS2*. As with the accrual model results, β_1 is significantly positive in both the *ROAPOS1* ($\beta_1 = 0.7725$, $p < .01$) and *ROAPOS2* ($\beta_1 = 0.3713$, $p < .05$) models, whereas β_2, β_3, and β_4 are not significant in either model. The economic magnitude of β_1 is also substantial. For example, when *Pred_fin* increases by 1, the probability that a firm reports a small gain instead of a small loss measured by *ROAPOS1* (*ROAPOS2*) increases by 18 percent (10 percent).[27] In sensitivity tests, we find that these results are robust to alternative cutoffs of small gains and small losses from ±2 percent to ±5 percent of ROA.[28]

Additional Tests Based on ROE Residuals

As discussed in Section II, SPVs can be employed to increase both earnings and cash flows. Hence, accrual tests only capture part of potential earnings management. Further, the small profits or losses tests examine only a small subsection of the firms. To capture the effect of SPVs on both accruals and cash flows in a large-sample setting, we use the return on equity (*ROE*) residual, another earnings management measure based on Feng (2007) that follows the spirit of the Jones model. Accordingly, we model *ROE* as a function

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[26] The low adjusted R^2s are not surprising, given the potential measurement error in discretionary accruals and *Pred_fin*.

[27] Previous research argues that the discontinuity around zero can be caused by reasons other than earnings management. For example, Durtschi and Easton (2005) document that the low frequency of small losses can be caused by the deflator (total assets). Our tests are less likely subject to this alternative explanation because we compute *Pred_fin* and *Pred_eco* after controlling for size. Similarly, Beaver et al. (2007) conclude that the discontinuity around zero can be partly explained by the asymmetric effects of income taxes for profit and loss firms. Income taxes are unlikely to drive the positive correlations between the frequency of small profits and *Pred_fin* because the tax variables belong to economic determinants instead of financial reporting variables. If these tax variables result in the high frequency of small profits, we should observe more positive correlations of the frequency of small profits with *Pred_eco* than with *Pred_fin*. Instead, we find that the likelihood of small gains is not significantly associated with *Pred_eco*, but significantly positively associated with *Pred_fin*.

[28] For example, when we use ±5 percent of ROA cutoff, the number of observations increases to 759 for the *ROAPOS1* regression and 777 for the *ROAPOS2* regression. The coefficient on *Pred_fin* is 0.4221 ($p < .01$) in a regression of *ROAPOS1*, and 0.3121 ($p < .05$) in the regression of *ROAPOS2*.

TABLE 7
Regressions of Earnings Management Measures on Predicted SPVs for Firms with SPVs

Panel A: OLS Regression Results of Accruals on SPVs as Predicted by Financial, Economic, and Control Variables

Coefficient Estimates (t-statistic)	**Pred. Sign**	***Total Accruals* (n = 1,494)**	***Discretionary Accruals* (n = 1,494)**	***Performance-Matched Discretionary Accruals* (n = 1,299)**
Intercept	?	−0.0608***	−0.0188	−0.0156
		(−3.26)	(−1.09)	(−0.69)
Pred_fin (β_1)	+	0.0158***	0.0088***	0.0075**
		(4.97)	(2.97)	(1.88)
Pred_eco (β_2)	?	0.0021	−0.0048***	−0.0022
		(1.19)	(−2.95)	(−1.01)
Pred_ctr (β_3)	?	−0.0012***	−0.0001	−0.0004
		(−4.03)	(−0.25)	(−0.88)
Pred_err (β_4)	?	−0.0017	0.0009	0.0013
		(−0.65)	(0.39)	(0.39)
Adjusted R^2		0.0156	0.0086	0.0010

Panel B: Logistic Regression Results of Frequency of Small Gains/Small Losses on SPVs as Predicted by Financial, Economic, and Control Variables

Coefficient Estimates (χ^2-statistic)	**Pred. Sign**	***ROAPOS1* (n = 155)**	***ROAPOS2* (n = 172)**
Intercept	?	1.9387	2.7958*
		(1.32)	(2.79)
Pred_fin (β_1)	+	0.7725***	0.3713**
		(7.07)	(2.87)
Pred_eco (β_2)	?	−0.0798	−0.0641
		(0.54)	(0.40)
Pred_ctr (β_3)	?	−0.0391	−0.0186
		(2.19)	(0.62)
Pred_err (β_4)	?	−0.2081	−0.2922
		(1.05)	(2.18)
Number of Obs. with Small Gains		104	119
Likelihood Ratio		14.52***	8.82*

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*, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively (one-tailed), except when the sign is not predicted (two-tailed).

Table 7 reports regression results of earnings management on SPVs as predicted by financial reporting variables (*Pred_fin*), economic variables (*Pred_eco*), control variables (*Pred_ctr*) and error (*Pred_err*). In Panel A the dependent variables are accruals (*Discretionary Accruals* and *Performance-Matched Discretionary Accruals*), with *Total Accruals* used as benchmarks, and in Panel B the dependent variables are frequencies of small gains/small losses (*ROAPOS1* and *ROAPOS2*). The marginal effects of *Pred_fin*, *Pred_eco*, and *Pred_ctr* on accruals and the frequency of small gains are estimated with the following regression models:

$$Accruals_{i,t} = \alpha + \beta_1 Pred\_fin_{i,t} + \beta_2 Pred\_eco_{i,t} + \beta_3 Pred\_ctr_{i,t} + \beta_4 Pred\_err_{i,t} + \varepsilon_{i,t}$$

$$ROAPOS_{i,t} = \frac{1}{1 + e^{-(\alpha + \beta_1 Pred\_fin_{i,t} + \beta_2 Pred\_eco_{i,t} + \beta_3 Pred\_ctr_{i,t} + \beta_4 Pred\_err_{i,t})}}$$

(*continued on next page*)

TABLE 7 (continued)

Discretionary Accruals are residuals from applying the Modified Jones model coefficients for the appropriate year and industry. The Modified Jones model, $TA_{i,t} = \alpha + \beta_1(\Delta Sales_{i,t} - \Delta REC_{i,t}) + \beta_2 PPE_{i,t} + \varepsilon_{i,t}$, is estimated across all Compustat firms by year and by industry, where *TA* (*Total Accruals*) is income before extraordinary items (#123) minus cash flows from operating activities (#308), scaled by beginning total assets (#6); and sales, receivables, and PPE are Compustat items #12, #2 and #8, respectively. ***Performance-Matched Discretionary Accruals*** are estimated from out-of-sample control firms matched on year, industry, return on assets and firm size. ***ROAPOS1*** [***ROAPOS2***] is 1 if a company reports small profits based on net income (#172) [income before extraordinary items (#18)], and 0 if a company reports small losses.

of explanatory variables identified by previous research and assume the residual of the model (*ROE_RES*) captures the abnormal *ROE* associated with earnings management.[29]

Our correlation analysis (not tabulated) shows that, although neither the overall number of SPVs nor *Pred_eco* is significantly correlated with *ROE_RES*, *Pred_fin* is positively correlated with *ROE_RES* (correlation = 0.051, $p < 0.01$). Further analysis indicates that the positive correlation between *Pred_fin* and *ROE_RES* is concentrated in firms with positive SPVs. These correlations also support the view that, controlling for known determinants of *ROE*, SPVs formed to meet financial reporting objectives are used to manage earnings.

VII. CONCLUSION

This paper investigates the prevalence, determinants, and earnings effects of SPVs using a large sample of firms. We provide evidence that SPV use grew substantially and pervasively from 1997 to 2004. We find that SPV use is associated with both financial reporting and economic reasons but that strong corporate governance tends to mitigate SPV use. In terms of economic magnitude, inter-quartile increases in leverage, availability of funds, intangible assets, and board independence result in changes in expected SPVs of 1.31, −0.36, 1.05, and −1.04, respectively. These effects are quite large, given that more than 70 percent of our sample observations indicate either zero or one SPV. Moreover, we document that SPVs sponsored for financial reporting objectives are related to earnings management, but this does not appear to be the case for SPVs set up mainly for economic and other reasons. Further, the magnitude of this association appears to be substantial. For example, when the number of predicted SPVs for financial reporting purposes increases by one, on average the probability that a firm reports a small gain instead of a small loss increases by 18 percent.

Our findings, particularly with respect to earnings management, provide large sample evidence on potential SPV misuse under the disclosure requirements that existed prior to FIN No. 46(R). However, it remains to be seen how the new disclosure regime enacted as

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[29] Following Feng (2007), we define *ROE_RES* as the firm-year residual of the following regression:

$$ROE_{i,t+1} = \alpha + \beta_1 ROE_{i,t} + \beta_2 \Delta ROE_{i,t} + \beta_3 SALEG_{i,t} + \varepsilon_{i,t+1}$$

where *ROE* is measured as pretax income scaled by the average of beginning- and end-of-year shareholder equity, $\Delta ROE_{i,t}$ represents the annual change in *ROE* of firm *i* in year *t*, and $SALEG_{i,t}$ is growth in sales. $ROE_{i,t}$ and $\Delta ROE_{i,t}$ control for the persistence and mean reversion properties of earnings (Brooks and Buckmaster 1976; Freeman et al. 1982; Fama and French 2000). *SALEG* controls for the differing patterns of mean reversion for growth and value firms observed by Penman (1991). In addition, Nissim and Penman (2001) find that extreme positive and negative *ROE* measures revert faster than moderate *ROE* measures, and Martin (1988) finds that earnings persistence is stronger among large firms. To control for the nonmonotonic effects of extreme returns and firm size, we rank all observations in each year in Compustat into three firm size groups and five *ROE* groups. We then estimate the regression model for each of the 15 combinations of size and *ROE* groups in each sample year.

part of the Enron backlash (i.e., negative publicity for SPVs, the demise of Arthur Andersen, the Sarbanes-Oxley Act, etc.) shapes firms' use of SPVs for both financial reporting and economic reasons. The SEC's (2005) descriptive study conducted under the mandate of the Sarbanes-Oxley legislation and the FASB's (2008) exposure draft further amending FIN No. 46(R) make it clear that legislators and regulators have considerable interest in gaining this understanding. We leave this examination for future research as data becomes available under the new regime. Further, while we have attempted to model the economic benefits of SPVs, our understanding of these benefits is limited; future research could also explore some of the other oft-touted benefits, such as SPVs' effect on firms' cost of capital.

APPENDIX A

Enron's SPVs as Reported in Its Exhibit 21 of SEC Form 10-K for the Years 1994 to 2000

						Per Enron's Federal Income Tax Returns	
Year	**Number of LPs**	**Number of LLCs**	**Total SPVs**	**Pretax Book Income (Compustat #170) (Millions)**	**Pretax U.S. Book Income (Compustat #272) (Millions)**	**Taxable Income (Millions)**	**U.S. Federal Income Tax Liability (Millions)**
1994	31	0	31	671	415		
1995	41	0	41	881	622		
1996	57	0	57	964	551	(310)	0
1997	227	75	302	164	96	(504)	0
1998	316	73	389	1,032	197	(753)	0
1999	555	24	579	1,339	357	(1,458)	0
2000	824	26	850	1,644	640	3,101	63[a]

This appendix reports Enron's SPVs from 1994 to 2000 based upon a count of the limited partnerships, limited liability partnerships, limited liability companies, and trusts listed in Exhibit 21 of SEC Form 10-K. Taxable income and tax liability information is available starting with 1996 from the Joint Committee on Taxation (2003).

[a] Includes $42 million of alternative minimum tax.

APPENDIX B
Excerpt of Enron Corp.'s Exhibit 21 of SEC Form 10-K for 2000

Exhibit 21
ENRON CORP. AND SUBSIDIARY COMPANIES

Subsidiary and Limited Partnership Interests as of 12/31/00
Subsidiary, Place of Incorporation

- ATLANTIC COMMERCIAL FINANCE B.V., i.l., (Cayman Islands)
- ATLANTIC COMMERCIAL FINANCE, INC, (Delaware)
  - Compression Projects Finance Ltd., (Cayman Islands)
  - EDC Atlantic Ltd., (Cayman Islands)
  - Enron Equity Corp., (Delaware)
    - Enron Dominican Republic Ltd., (Cayman Islands)
      - Smith/Enron Cogeneration **Limited Partnership**, (Turks & Caicos Isles)
      - Smith/Enron O&M **Limited Partnership**, (Turks & Caicos Isles)
    - Enron Dominican Republic Operations Ltd., (Cayman Islands)
      - Smith/Enron Cogeneration **Limited Partnership**, (Turks & Caicos Isles)
      - Smith/Enron O&M **Limited Partnership**, (Turks & Caicos Isles)
    - Enron Global Power & Pipelines **LLC**, (Delaware)
      - Enron Dominicana Holding Limited, (Cayman Islands)
        - Enron Dominicana **Limited Partnership**, (Cayman Islands)
          - Smith/Enron Cogeneration **Limited Partnership**, (Turks & Caicos Isles)

Other entities listed on other pages of Exhibit 21 identified as off-Enron's balance sheet in Powers (2002) and SEC (2005):

- SE Raptor **L.P.**, (Delaware)
- JEDI Linden GP, **L.L.C.**, (Delaware)
- Whitewing Associates **LP**, (Delaware)
  - SE Raven **L.P.**, (Delaware)
    - SE Thunderbird, **L.P.**, (Delaware)

This appendix provides a partial listing of the entities on the first of 51 pages of Exhibit 21 from Enron Corp.'s SEC Form 10-K for the year ended December 31, 2000. The appendix also includes the entities Whitewing Associates LP, JEDI Linden LLC, SE Raptor LP, SE Raven LP, and SE Thunderbird LP listed in subsequent pages of the same exhibit and that have been identified as some of Enron's SPVs that were off-balance sheet but were used to manage its debt and earnings (Powers 2002; SEC 2005). The highlighted words in **bold** match the search terms used to identify SPVs.

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The Quality of Analysts' Cash Flow Forecasts

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ABSTRACT: This study examines properties of analysts' cash flow forecasts and compares them to those exhibited by analysts' earnings forecasts. Our results indicate that analysts' cash flow forecasts are less accurate than analysts' earnings forecasts and improve at a slower rate during the forecast period. Further, cash flow forecasts appear to be a naïve extension of analysts' earnings forecasts, thus providing limited information on expected changes in working capital. We also find that analysts' forecasts of cash flows are of limited information content and are only weakly associated with stock returns. Finally, estimating expected accruals as the difference between analysts' earnings forecasts and their cash flow forecasts does not result in a better detection of earnings management than achieved by commonly used accrual models.

Keywords: *analysts' cash flow forecasts; earnings forecasts; forecast accuracy; earnings management; accruals.*

Data Availability: *Data are available from public sources indicated in the text.*

I. INTRODUCTION

Financial analysts generate a number of important products, among them earnings forecasts, stock recommendations, and target stock prices. In recent years, analysts have gradually introduced yet another product—forecasts of firms' operating cash flows. Our analysis shows that the percentage of firms receiving earnings forecasts that also

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receive cash flow forecasts has increased from 2.5 percent in 1993 to 57.2 percent in 2005. This trend, along with the greater availability of analysts' cash flow forecasts through commercial databases, has led to an increased number of studies that employ these forecasts in a variety of research settings.

The main explanation offered in the literature for the upward trend in the frequency of analysts' cash flow forecasts and for its cross-sectional variation is investor demand. Specifically, these forecasts are demanded by investors and supplied by analysts in cases where earnings are likely to be of low quality (see DeFond and Hung 2003). The "demand hypothesis" implicitly assumes that analysts' cash flow forecasts are of a sufficiently high quality to create such a demand and that they cannot be simply replicated by an extrapolation of analysts' already-produced earnings forecasts.

The quality of cash flow forecasts relative to earnings forecasts is likely to be affected by a myriad of factors. These include the inherent variability and measurement errors in cash flows as compared with accruals, different incentives and opportunities for management to manipulate cash flows and earnings, and different incentives of analysts to invest resources in the production of cash flow versus earnings forecasts. The effects of these factors, which are further discussed in Section III, are often offsetting, rendering the relative quality of cash flow forecasts an empirical question.

While the accounting and finance literature has extensively examined various properties of analysts' *earnings* forecasts, very little is known about the properties of analysts' cash flow forecasts, possibly due to their short history and their more limited availability. One of the objectives of this study is to close this knowledge gap by exploring basic forecasting properties such as accuracy, bias, and efficiency, and by benchmarking the performance of analysts' cash flow forecasts against that of the well-studied earnings forecasts. In addition to examining basic forecasting properties, we investigate the degree of sophistication reflected in analysts' cash flow forecasts by testing the extent to which these forecasts incorporate projections of working capital accruals and other adjustments to income rather than merely representing the addition of some estimate of depreciation and amortization to the existing earnings forecasts.

Another objective of testing the properties of analysts' cash flow forecasts is to provide insights on the plausibility of the demand explanation for the intra-temporal and cross-sectional variation in the provision of analysts' cash flow forecasts. Finding that analysts' cash flow forecasts are inaccurate or that they are merely a simple extrapolation of analysts' earnings forecasts would not be supportive of the "demand hypothesis."

In addition to exploring key properties of analysts' cash flow forecasts, we evaluate two potential uses of these forecasts in research settings. The first is as a proxy for the unobservable market expectation of cash flows. In line with past research on analysts' earnings forecasts, we gauge the extent to which analysts' cash flow forecasts represent the market expectation by examining the association between their forecast errors and stock returns. The second potential use of these cash flow forecasts is as a basis for estimating expected accruals and extracting unexpected accruals. Expected accruals can be inferred by subtracting analysts' cash flow forecasts from their contemporaneous earnings forecasts. We test the power and efficiency of this "accruals model" in detecting earnings management and compare the results to those produced by the modified Jones model (Dechow et al. 1995) and that employed by Dechow and Dichev (2002), models commonly used in the literature.

Our results indicate that while analysts' cash flow forecasts are more accurate than forecasts derived from a time-series model, they are less accurate than their earnings forecasts. This lower accuracy is only partially attributable to data-quality issues or the inherent difficulty of forecasting cash flows stemming from the higher variability of the cash flow series as compared with the earnings series. Further, the rate of improvement in the accuracy of cash flow forecasts over the forecast period is much lower than that of earnings forecasts. We also find that analysts' cash flow forecasts are, in essence, a naïve extension of their earnings forecasts. As a result, they provide limited incremental information on expected changes in firms' working capital.

The findings that analysts' cash flow forecasts are less accurate than their earnings forecasts and that cash flow forecasts are merely a simple extrapolation of their earnings forecasts do not necessarily mean that they are not potentially useful to investors. However, the findings suggest that there are factors beyond forecasting effectiveness that make cash flow forecasts useful and which may explain their increased availability. We comment on the implications of our findings for the "demand hypothesis" in Section VII, after presenting the results of our tests.

We also report on two additional findings. First, in contrast to analysts' earnings forecasts, analysts' cash flow forecasts are only weakly associated with stock price movements and thus do not appear to be a good surrogate for the unobservable market expectation of cash flows. Second, we show that estimating expected accruals based on the difference between analysts' earnings and cash flow forecasts is not more effective in detecting earnings management than other models used by researchers.

The study contributes to the accounting literature in several ways. It is the first to comprehensively document important properties of cash flow forecasts and to assess their quality. The finding of a low accuracy of these forecasts, the fact that they represent in essence a trivial extension of analysts' earnings forecasts, and the evidence of serious data-quality issues are relevant for investors who might consider these forecasts in valuation and investment decisions and researchers who employ cash flow forecasts in various research contexts. Researchers using cash flow forecasts may also be guided in their sample selection criteria by our finding that the quality of cash flow forecasts varies considerably depending on certain firm attributes. Finally, two additional results are relevant for future research. First, our finding that errors in analysts' cash flow forecasts are only marginally associated with stock price movements (after controlling for analysts' earnings forecasts) is relevant for any research in which these forecasts might be used as a surrogate for the unobservable market expectation of cash flows. Second, our finding that analysts' earnings and cash flow forecasts are unlikely to generate an accruals expectation model that is superior to those commonly used in the literature is relevant for research on earnings management.

In the next section we review the related research on cash flow forecasts. In Section III we frame our research questions, discussing the expectations regarding the relative accuracy of earnings and cash flow forecasts. The empirical design and tests used to explore the properties and attributes of cash flow forecasts are contained in Section IV. Section V contains a description of the sample and the data used in the tests. The results are presented and discussed in Section VI. The relevance of the findings to the "demand hypothesis" is discussed in Section VII. Section VIII contains a summary and concluding remarks.

II. RELATED RESEARCH

DeFond and Hung (2003) is the first study to document the increased propensity of analysts to issue cash flow forecasts and to examine the explanation for this trend. They hypothesize and find empirical support consistent with the notion that analysts have provided more cash flow forecasts in recent years in response to demand by investors who are increasingly concerned about the inherent shortcomings of accrual accounting, such as its subjective nature and its susceptibility to earnings management.[1] Since cash flow from operations is perceived to be more objective and less vulnerable to management manipulation, it is commonly viewed as a valuable supplement to earnings information. DeFond and Hung (2003) show that, consistent with cash flow forecasts being driven by investor demand, analysts' propensity to produce these forecasts increases with the magnitude of accruals, latitude available to management in choosing accounting methods, earnings volatility, capital intensity, and financial distress.[2] In a complementary study, DeFond and Hung (2007) examine analysts' propensity to issue cash flows across countries with different reporting regimes. They find that analysts are more likely to supplement their earnings forecasts with cash flow forecasts in countries where investor protection is poor and earnings are of a lower quality, providing further support for the demand hypothesis.[3]

In line with the notion that cash flow forecasts are driven by investor demand arising from earnings quality concerns, a number of studies examine how the presence of such forecasts affects earnings quality, predictability, and valuation. McInnis and Collins (2008) find that the presence of cash flow forecasts elevates earnings quality, a finding that they attribute to the implicit forecast of accruals provided by comparing the earnings and cash flow forecasts and the increased transparency of any accrual manipulations that might be undertaken to meet earnings thresholds.

While cash flow forecasts might reduce earnings management, Call (2007) finds that their presence increases the propensity of firms to manipulate their cash flow from operations. Further, he finds that when cash flow forecasts are provided, investors assign more weight to the cash flow component of earnings in stock valuation, consistent with the signaling value of the presence of cash flow forecasts.

A number of studies show that the mere existence of cash flow forecasts has an indirect benefit on the accuracy of analysts' earnings forecasts, thus likely incentivizing analysts to engage in cash flow forecasting. Pae et al. (2007) and Call et al. (2009) find that analysts' earnings forecasts are more accurate if they also produce a cash flow forecast. Call et al. (2009) further find that analysts who issue cash flow forecasts have a better understanding of the time-series properties of the earnings process and are less likely to be terminated, suggesting that cash flow forecast accuracy is relevant for analysts' career success (see Lehavy 2009).

Other studies use analysts' cash flow forecasts to proxy for the market expectation of cash flows. DeFond and Hung (2003) use these forecasts to estimate the unexpected cash flows in their analysis of earnings announcement period returns. Similarly, McInnis and Collins (2008) use cash flow forecasts to derive unexpected cash flows in their analysis of investors' differential response to cash flow and accrual information provided in the earnings announcement.

Brown and Pinello (2008), McInnis and Collins (2008), and Melendrez et al. (2009) use analysts' cash flow forecasts to form a measure of unexpected accruals by subtracting them from their corresponding analysts' earnings forecasts. Finally, the errors in analysts' cash flow forecasts are used by Zhang (2008) to examine the market reward and analysts' response to meeting or beating these forecasts, and by Brown and Pinello (2008) to analyze the circumstances present when firms meet either the earnings or cash flow forecast, but not both.

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[1] Investor demand is also among the factors found to prompt management to provide cash flow forecasts (see Wasley and Wu 2006).

[2] Ertimur and Stubben (2005) show that the supply of cash flow forecasts, in addition to being affected by demand factors, is also influenced by analyst and brokerage house characteristics.

[3] Hail (2007) concludes that the DeFond and Hung (2007) findings, which are based on cross-sectional analyses, do not necessarily hold in a time-series setting.

As this literature review indicates, some studies incorporate the values of the cash flow forecasts in their design, while others use merely the presence of cash flow forecasts as an indicator variable. The results of our study regarding the quality of cash flow forecasts have implications for both types of studies. As discussed in Section VII, our results are relevant to the plausibility of the demand hypothesis and the notion that the presence of cash flow forecasts dampens the propensity to manage earnings.

III. RELATIVE QUALITY OF CASH FLOW AND EARNINGS FORECASTS

A priori, it is not clear whether earnings or cash flow forecasts would be of a higher quality. On one hand, given the smoothing effect that accruals have on earnings, the earnings series may be smoother and thus easier to predict than the presumably more volatile cash flow series. Further, because they are the most acceptable summary measure of the company's results from operations and are followed more by the media, one would expect analysts to invest greater resources in forecasting earnings than other performance measures and, as a result, to produce earnings forecasts that are of a higher quality than cash flow forecasts. It also seems logical to assume that operating cash flow forecasts are prepared after projections of revenues and expenses (that is, earnings) are made. If earnings forecast errors are not negatively correlated with the errors in the estimated adjustments that are made to earnings when predicting cash flows, then the accuracy of cash flow forecasts will be lower than that of earnings forecasts. Finally, the effect of various economic events such as new orders, interest rate changes, or restructuring activities on earnings is likely to be much easier to identify and estimate than the impact of these events on the cash flows in a given reporting period.

On the other hand, accrual-based earnings are subject to a host of estimation errors that make their forecasting difficult. Further, earnings may be more prone to manipulation by management both because many accruals are based on management estimates (creating an opportunity to manage earnings) and because management compensation is typically based on earnings rather than cash flows (providing an incentive to manage earnings). The fact that earnings are more susceptible to manipulation than cash flows is likely to make earnings more difficult to forecast and, in turn, result in earnings forecasts that are of a lower quality than cash flow forecasts. The quality of earnings forecasts may also depend on the concurrent production of cash flow forecasts. As noted earlier, prior research shows that analysts' forecasts of earnings are more accurate when accompanied by cash flow forecasts (Call et al. 2009; Pae et al. 2007) suggesting that analysts adopt a more structured and disciplined approach to forecasting earnings when they also issue cash flow forecasts.

IV. EMPIRICAL DESIGN AND TESTS

Properties of Analysts' Cash Flow Forecasts

We examine four properties of the performance of analysts' forecasts of cash flows: accuracy, bias, efficiency, and intra-year improvement. We then compare these properties of analysts' cash flow forecasts to those of analysts' earnings forecasts. We also compare analysts' ability to forecast cash flows to that of a mechanical, time-series model. In these analyses, we examine cash flow forecasts for year t made at two points in time: at the beginning of the year soon after the announcement of the prior year's (year $t-1$) earnings and at the end of the year immediately before the announcement of the current year's (year t) earnings.

Accuracy is assessed using two forecast error measures, the absolute forecast error and the squared forecast error, as follows (the subscripts i and t are used to indicate the firm and year, respectively):

$$\text{Absolute Error} = |A_{it} - F_{it}| \tag{1a}$$

$$\text{Squared Error} = (A_{it} - F_{it})^2, \tag{1b}$$

where A is the actual value of earnings per share or cash flow per share and F is the forecasted value. *Bias* is measured as the signed forecast error:

$$Bias_{it} = (A_{it} - F_{it}). \tag{2}$$

All three measures are deflated, alternately, by the absolute value of the actual value and by the end-of-period price.

Forecast efficiency is gauged by the serial correlation in the prediction error. Serial correlation is measured by the slope coefficient, β, of the following time-series regression that relates the signed cash flow forecast error (i.e., the bias) in the current year to that in the prior year:

$$FE_{it} = \alpha + \beta FE_{it-1} + \varepsilon_{it}. \tag{3}$$

The forecast error, FE, is alternately standardized by the absolute value of the actual value or the end-of-period price. The presence of a significant correlation as indicated by the significance of β would indicate that information contained in the prediction error is not used efficiently in generating future forecasts.

Intra-year improvement in the forecasts is measured as the extent of decline in the analysts' forecast error between the beginning-of-year and end-of-year forecasts. Specifically:

$$Improvement_{it} = 1 - (\text{Error}_{i,\text{END}(t)}/\text{Error}_{i,\text{BEG}(t)}) \tag{4}$$

where Error is the absolute or squared error (Equation (1a) or (1b) above). We compare these four properties of analysts' forecasts of cash flows to those of analysts' earnings forecasts.

We also compare the first three properties discussed above, accuracy, bias, and forecast efficiency, to a time-series model that relies on past cash flows and the reversal of past accruals. As shown by Dechow et al. (1998), past earnings are a better predictor of future cash flows than are past cash flows. Extending this work, Barth et al. (2001) find that disaggregating past cash flows and accruals into their components improves cash flow predictability. We follow their approach, predicting cash flow from operations (CF) in year t as a function of the previous year's cash flow from operations, changes in working capital accounts (accounts receivable (AR), inventory (INV), and accounts payable (AP)), the amount of the depreciation and amortization expense (DEP), and other accruals ($Other$),[4] as follows:

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[4] *Other* is computed as income from continuing operations *(INCCO)* minus the sum of cash flow from operations, the change in the three working capital accounts, and the depreciation and amortization expense as follows: $Other_{it-1} = INCCO_{it-1} - [CF_{it-1} + \Delta AR_{it-1} + \Delta INV_{it-1} + \Delta AP_{it-1} + DEP_{it-1}]$.

$$CF_{it} = \varphi_0 + \varphi_1 CF_{it-1} + \varphi_2 \Delta AR_{it-1} + \varphi_3 \Delta INV_{it-1} + \varphi_4 \Delta AP_{it-1} + \varphi_5 DEP_{it-1} + \varphi_6 Other_{it-1} + \varepsilon_{it}. \quad (5)$$

Sophistication of Analysts' Cash Flow Forecasts

A simple relation exists between earnings and cash flow from operations. Specifically, cash flow from operations is equal to earnings plus depreciation, amortization, and other non-cash charges, minus (plus) non-cash gains (losses) and the net increase (decrease) in working capital accruals. Since analysts' earnings forecasts routinely accompany their cash flow forecasts, a question arises regarding the incremental contribution of the latter. Do analysts' cash flow forecasts merely represent their earnings forecasts adjusted for projected depreciation and amortization or are they more sophisticated as a result of incorporating the more challenging prediction of working capital accruals? A review of scores of analysts' research reports indicates that although some appear to have incorporated working capital accruals in their cash flow forecasts, most do not spell out how they define cash flows, nor do they detail the derivation of their cash flow forecasts. The underlying assumption of most studies that use analysts' cash flow forecasts either as proxy for market expectations or as a signal of earnings quality is that these forecasts are more sophisticated than a simple derivative of analysts' own earnings forecasts. We test whether cash flow forecasts are indeed sophisticated or are of a more naïve form such as a straightforward extension of analysts' earnings forecasts.[5]

We assess the extent of sophistication inherent in analysts' cash flow forecasts through three related tests. First, we examine the incremental accuracy of analysts' forecasts of cash flows over a cash flow prediction model that represents a naïve extrapolation of analysts' own earnings forecasts. Specifically, we model analysts' cash flows forecasts for the current year, *F(CF)*, as a simple addition of their contemporaneous forecast of earnings for the same year, *F(Earnings)*, plus the current year's realized depreciation and amortization expense on a per share basis, *DEP*, as follows:

$$F(CF_{it}) = F(Earnings_{it}) + DEP_{it}. \quad (6)$$

We compare the magnitude of the absolute error and the squared error (standardized, alternately, by the actual cash flow or the firm's end-of-period stock price) of this naïve extrapolation with the errors from analysts' cash flow forecasts (Measures (1a) and (1b) as described above).

The second test of the extent of sophistication in analysts' cash flow forecasts is based on the correlation between the error in analysts' earnings forecasts and the error in their cash flow forecasts. If analysts' cash flow forecasts are merely a naïve extrapolation of their earnings forecasts, then we would observe a high correlation between their respective forecast errors.

The third test of the extent of sophistication in analysts' cash flow forecasts focuses on the degree to which these forecasts incorporate projections of the changes in working capital accounts as well as other adjustments to earnings, in addition to the trivial adjustment for depreciation and amortization. For this test, we estimate the following regression:

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[5] DeFond and Hung (2003, 84) conclude from several full-text reports by analysts whose forecasts are included in the I/B/E/S database that "it appears that the cash flow forecasts are not a trivial translation of predicted earnings, but rather the result of difficult and costly information processing that involves the prediction of working capital and deferred taxes." Subsequent studies by McInnis and Collins (2008, 5) and Pae et al. (2007, 7) appear to rely on DeFond and Hung's (2003) conclusion to motivate their use of analysts' cash flow forecasts.

$$F(CF_{it}) = \gamma_0 + \gamma_1 F(Earnings_{it}) + \gamma_2 DEP_{it} + \gamma_3 \Delta WC_{it} + \gamma_4 Other_{it} + \eta_{it} \quad (7)$$

where $F(CF_t)$ and $F(Earnings_t)$ are the analysts' forecasts for, respectively, cash flows and earnings for year t, and DEP_t, ΔWC_t, and $Other_t$ are, respectively, the forecasted values for year t of the depreciation and amortization expense, change in the working capital accounts (Accounts Receivable, Inventory, and Accounts Payable), and all other adjustments needed to reconcile income from continuing operations in year t with cash flow from operations. The sign of the independent variables in Regression (7) is constructed in such a way that a positive (negative) sign indicates that the amount should be added to (subtracted from) earnings to derive cash flow from operations. Since the forecasted values of DEP_t, ΔWC_t, and $Other_t$ are not observable, we assume perfect foresight by analysts and use the actual values of these variables in year t.

If analysts form their cash flow forecasts by adding depreciation to their earnings forecasts and then subtracting (or adding) the net increase (decrease) in the working capital accounts, the slope coefficients of these variables (γ_2, γ_3, and γ_4) should not significantly differ from 1. If, however, analysts fail to add back depreciation, adjust for the change in working capital accounts, or make the other adjustments, these slope coefficients would not significantly differ from 0.

Analysts' Cash Flow Forecasts as a Surrogate for Market Expectations

Analysts' forecasts of earnings have been found to have information content (Givoly and Lakonishok 1979) and to be a better surrogate for the unobservable market expectation of earnings than forecasts produced by mechanical earnings prediction models (Fried and Givoly 1982; Brown et al. 1987). To gauge the extent to which analysts' *cash flow forecasts* provide a reasonable surrogate for investors' cash flow expectations, we estimate the association between abnormal returns and unexpected cash flows as proxied by the prediction error of analysts' cash flow forecasts, controlling for unexpected earnings. Specifically, we estimate the incremental association between abnormal returns and unexpected cash flows over the forecasted year t, controlling for unexpected earnings, using the following regression:

$$CAR_{it} = \alpha + \beta_1 FE(Earnings_{it}) + \beta_2 FE(CF_{it}) + \varepsilon_{it} \quad (8)$$

where *CAR* is the cumulative abnormal return over the 12-month period beginning with the fourth month after the end of fiscal year $t-1$ and ending with the third month following the end of fiscal year t.[6] *FE*(*Earnings*) and *FE*(*CF*) are, respectively, the beginning-of-the-year forecast errors for earnings and cash flows, deflated by price. We also examine the association between the earnings announcement period returns and the errors in the forecasts of cash flow and earnings outstanding at the time of the announcement by estimating Regression (8) over the four-day window beginning one day prior to the earnings announcement. Additionally, we assess the incremental information content of cash flow forecasts with respect to the mechanical cash flow prediction model by adding the prediction error from the mechanical model specified in Equation (5) as an explanatory variable in Regression (8).

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[6] To calculate monthly abnormal returns over the forecast year (year t), the market model is estimated over the 60-month period ending with the last month of fiscal year $t-1$. The value-weighted index is used to proxy for the market return. Regression parameters from the market model are then used to calculate monthly abnormal returns. The cumulative abnormal return, *CAR*, for year t is the sum of the 12 monthly abnormal returns beginning with the fourth month of fiscal year t in order to exclude the effect of the announcement of earnings for year $t-1$. Very similar results are obtained when size-adjusted returns are used.

Use of Analysts' Cash Flow Forecasts to Form an Accruals Expectation Model

Accounting research, primarily studies on earnings management, has been challenged by the daunting task of measuring what has been termed "abnormal" or "discretionary" accruals. While a variety of models have been used to estimate these accruals, there is a general understanding that these models suffer from various limitations and rely on certain assumptions about the functional relationship between accruals and the level of operating activity.

A number of recent studies use the difference between analysts' cash flow and earnings forecast errors as a measure of unexpected accruals (see, for example, Brown and Pinello 2008; McInnis and Collins 2008; Melendrez et al. 2009). We test the power and efficiency of this analyst-based accruals expectation model in detecting earnings management by comparing it to the performance of the modified Jones model (Dechow et al. 1995) and the Dechow and Dichev (2002) models, two commonly used models in the literature.

To conduct tests on how effective the analyst-based accruals expectation model is in identifying earnings management relative to the modified Jones and Dechow and Dichev models, we first identify two samples containing cases (firm-years) for which earnings management is likely to have occurred. The first sample consists of firm-years for which earnings are eventually restated downward. For this "restatement sample," the presumption is that the originally reported earnings were managed, hence prompting the need for a restatement. The second sample of cases where earnings management is likely to have occurred consists of years in which firms met or barely surpassed an earnings threshold. We consider two earnings thresholds: loss avoidance and avoidance of an earnings decline relative to the same quarter in the previous year. Earnings are identified as meeting or being just above these thresholds when they exceed the thresholds by no more than some predetermined amount. These cases are denoted as "loss avoiders" or "earnings decline avoiders."[7]

To gauge the efficacy of the accruals expectation model derived from analysts' cash flow forecasts, we compare its ability to identify earnings management cases in the two samples described above with that of the modified Jones and Dechow and Dichev models. For each of these models we derive unexpected accruals for every firm-year in the two samples. Unexpected accruals are identified as those whose standardized absolute value (the absolute value divided by the standard deviation of the unexpected accruals produced by the respective model across all firm-years) exceeds the values of, alternatively, 1.0, 1.5, or 2.0. Finally, we tally the frequency of Type I and Type II errors of the three models in classifying firm-years as containing or not containing earnings management.

V. DATA AND SAMPLE

We obtained one-year-ahead forecasts of cash flows and earnings as well as their respective actual values from the I/B/E/S detail file, which contains the forecasts made by individual analysts. For each fiscal year, we construct two measures of the consensus cash flow and the consensus earnings forecasts: one based on the forecasts outstanding at the beginning of the year and the other based on the forecasts outstanding at the end of the year. To avoid stale forecasts, forecasts outstanding more than 90 days from the date of issuance are excluded.[8] The beginning-of-year consensus forecasts are computed as the mean of all individual forecasts outstanding on the 30th day subsequent to the prior year's earnings announcement. The end-of-year consensus forecasts are computed as the mean of all individual forecasts outstanding immediately prior to the announcement of the current year's earnings. To ensure comparability of the evidence on the properties of cash flow and earnings forecasts, we restrict the sample to firm-years in which both cash flow and earnings forecasts are available from the same individual analyst. Accordingly, the consensus cash flow and earnings forecasts are based on an identical number of analysts' forecasts. When available, actual values provided by I/B/E/S are used to calculate earnings and cash flow forecast errors to ensure compatibility with the forecasts.[9]

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[7] Earnings management is also likely to have occurred when firms report a small favorable earnings surprise. We do not consider these cases since, to the extent that the surprise is based on analysts' forecasts, use of this sample in these predictive ability tests would tilt the results in favor of the analyst-based model.

An issue identified by prior research (e.g., Melendrez et al. 2009) is that I/B/E/S does not provide the actual value of cash flows for a large number of observations. For these observations (which represent more than half of the sample, as shown later in Table 5), we use the actual values reported by Compustat (annual data item #308 divided by the number of shares outstanding from I/B/E/S). Other financial statement information is retrieved from Compustat. Return data are obtained from the Center for Research in Security Prices (CRSP).

Table 1 presents the main sample selection criteria and their effect on the sample size. The initial sample consists of 19,522 firm-years with at least one cash flow forecast available on the I/B/E/S database. Eliminating forecasts for which there is not a corresponding earnings forecast issued by the same analyst (262), stale forecasts (5,162), forecasts that are missing both the actual earnings and actual cash flow amounts (386) and forecasts for which no actual cash flow figure is available from either I/B/E/S or Compustat (2,828) results in a final sample of 10,884 end-of-year forecasts. The elimination of a greater number of stale forecasts at the beginning of the year (3,341) leads to a final sample of 7,543 such forecasts. Certain analyses have additional data requirements and therefore are conducted on reduced samples.

VI. RESULTS

Cash Flow Forecasts—Descriptive Statistics

Table 2 provides descriptive statistics on the availability of cash flow forecasts. As shown in Panel A, the frequency of cash flow forecasts has increased sharply over time, from 118 such forecasts in 1993 (2.5 percent of the firms that had earnings forecasts) to 3,261 forecasts in 2005 (57.2 percent of the firms that had earnings forecasts). Mirroring this, the mean number of forecasts provided per firm also increased over the period, from 3.2 to 14.3. Yet, the average number of cash flow forecasts per firm, even for the most

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[8] The main analyses were replicating on a smaller sample that excluded forecasts older than 45 days. The results (not tabulated) for this stricter definition of "staleness" are essentially the same.

[9] In discussing the actual earnings data, Thomson Financial Glossary (2004), states: "Reported earnings are entered into the database on the same basis as the analysts' forecasts. By and large, this means operating earnings as opposed to net income ... [W]ith very few exceptions analysts make their earnings forecasts on a continuing operations basis. This means that Thomson Financial receives an analyst's forecast after discontinued operations, extraordinary charges, and other non-operating items have been backed out ... Thomson Financial adjusts reported earnings to match analysts' forecasts on both an annual and quarterly basis. This is why Thomson Financial actuals may not agree with other published actuals, e.g., Compustat." While no explanation is provided about the adjustments made to the actual cash flow amounts, I/B/E/S representatives confirmed that this explanation applies also to the actual cash flow data.

TABLE 1
Sample Selection Criteria and Their Effect on Sample Size

Selection Criteria	Cash Flow Forecasts	Earnings Forecasts
Total number of firms with at least one one-year-ahead forecast made during the year	19,522	74,393
(1) Firm-years with an earnings forecast but no cash flow forecast by the same analyst for that firm-year	—	(55,133)
(2) Firm-years with a cash flow forecast but no accompanying earnings forecast by the same analyst for that firm-year	(262)	—
(3) Firm-years with a stale forecast[a]	(5,162)	(5,162)
(4) Both actual earnings and actual cash flow amounts are missing	(386)	(386)
(5) Actual cash flow amount is missing	(2,828)	(2,828)
Final sample of end-of-year cash flow and earnings forecasts	10,884	10,884
(6) Firm-years with a stale forecast at the beginning of the year[a]	(3,341)	(3,341)
Final sample of beginning-of-year cash flow and earnings forecasts	7,543	7,543

[a] Stale forecasts are defined as those outstanding for more than 90 days. The presence of a stale earnings or cash flow forecast results in the elimination of both forecasts.

recent year presented, is still about half the average number of earnings forecasts per firm (14.3 versus 28.0).

Panel B of Table 2 shows the frequency of cash flow and earnings forecasts across 12 industries. Over the sample period from 1993–2005, there is considerable dispersion across the industries in the frequency of cash flow forecasts. Similar to the findings of DeFond and Hung (2003), we find that cash flow forecasts are quite prevalent in the energy industry (issued for 78.7 percent of the firms) and much less common in other industries such as finance, technology, or healthcare (issued for less than 15 percent of the firms in these industries). By 2005, almost all firms in the energy industry (96.8 percent) and at least 50 percent of the firms in eight of the other 11 industries had cash flow forecasts. According to I/B/E/S representatives, the fairly monotonic increase in the number of analysts' cash flow forecasts over time represents not only an increased rate of production of cash flow forecasts by analysts, but also greater collection efforts of such forecasts by I/B/E/S. Both factors may reflect an increased demand for these forecasts, particularly in recent years due to the wave of accounting scandals in the early 2000s and the questions they raised about the quality of earnings.

Forecasting Performance
Accuracy

Table 3 shows the accuracy of analysts' cash flow forecasts as compared with the accuracy of their earnings forecasts, as well as with the accuracy of the forecasts produced by the time-series model (Equation (5)).[10] The results indicate that analysts' cash flow forecasts are substantially less accurate than their earnings forecasts. For the beginning-of-year forecasts, the mean (median) *squared error* of analysts' cash flow forecasts is 0.890 (0.150), compared with only 0.359 (0.036) for analysts' earnings forecasts. This same pattern is observed when the *absolute errors* of analysts' forecasts are considered. These

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[10] The table shows the results for the accuracy measures deflated by the absolute value of the actual numbers. Replicating the accuracy tests using price as a deflator yields qualitatively similar results and inferences.

TABLE 2
Descriptive Statistics on Availability of Analysts' Cash Flow and Earnings Forecasts

Panel A: By Year

	Number of Firms with at Least One One-Year-Ahead Forecast Made During the Year			Analysts' Cash Flow Forecasts				Analysts' Earnings Forecasts			
				Number of Forecasts per Firm		Number of Analysts Issuing Forecasts per Firm		Number of Forecasts per Firm		Number of Analysts Issuing Forecasts per Firm	
Year	Cash Flow Forecasts	Earnings Forecast	% of Firms with a Cash Flow Forecast[a]	Mean	Median	Mean	Median	Mean	Median	Mean	Median
1993	118	4,672	2.5%	3.2	2	3.1	2	21.6	12	7.3	4
1994	579	5,193	11.1%	7.6	2	3.5	2	19.8	11	6.9	4
1995	811	5,684	14.3%	8.0	4	3.7	2	20.0	11	6.6	4
1996	799	6,378	12.5%	15.7	8	5.6	4	18.8	10	6.3	4
1997	965	6,796	14.2%	15.1	8	5.2	3	18.4	10	6.2	4
1998	1,131	6,853	16.5%	15.5	7	5.0	3	19.9	10	6.3	4
1999	1,715	6,587	26.0%	14.1	5	4.0	2	20.3	10	6.6	4
2000	1,689	6,132	27.5%	12.8	6	3.9	2	20.5	10	6.8	4
2001	1,173	5,129	22.9%	13.9	3	4.4	2	25.3	12	7.6	5
2002	1,830	4,890	37.4%	10.2	3	3.3	2	25.1	13	7.5	5
2003	2,504	4,917	50.9%	13.9	7	3.7	2	26.8	14	7.6	5
2004	2,947	5,456	54.0%	14.1	7	3.5	2	27.3	14	7.2	5
2005	3,261	5,706	57.2%	14.3	7	3.3	2	28.0	15	7.3	5
1993–2005	19,522	74,393	26.2%	13.3	6	3.9	2	22.2	11	6.9	4

(*continued on next page*)

TABLE 2 (continued)

Panel B: By Industry Group[b]

Industry Group	Number of Firms with at Least One One-Year-Ahead Forecast Made During the Year All Years 1993–2005 CF Forecast	 All Years 1993–2005 Earnings Forecast	 All Years 1993–2005 % of Firms with a CF Forecast[a]	 1995 CF Forecast	 1995 Earnings Forecast	 1995 % of Firms with a CF Forecast[a]	 2005 CF Forecast	 2005 Earnings Forecast	 2005 % of Firms with a CF Forecast[a]
Basic Industries	3,213	6,940	46.3%	190	626	30.4%	439	555	79.1%
Capital Goods	1,306	6,256	20.9%	56	540	10.4%	213	396	53.8%
Consumer Durables	607	2,792	21.7%	30	273	11.0%	111	180	61.7%
Consumer Non-Durables	1,020	3,799	26.8%	51	338	15.1%	153	253	60.5%
Consumer Services	3,034	11,857	25.6%	104	883	11.8%	505	839	60.2%
Energy	3,998	5,083	78.7%	224	339	66.1%	461	476	96.8%
Finance	1,590	12,359	12.9%	25	904	2.8%	367	1,064	34.5%
Health Care	1,187	8,076	14.7%	28	560	5.0%	289	680	42.5%
Public Utilities	1,221	3,376	36.2%	26	51	51.0%	23	31	74.2%
Technology	1,654	12,001	13.8%	48	275	17.5%	187	230	81.3%
Transportation	502	1,415	35.5%	17	781	2.2%	412	873	47.2%
Miscellaneous/Undesignated	190	439	43.3%	12	114	10.5%	101	129	78.3%
All Industries	19,522	74,393	26.2%	811	5,684	14.3%	3,261	5,706	57.1%

This table presents descriptive statistics on the availability of cash flow and earnings forecasts in the I/B/E/S detail data files.

Panel A indicates the number of firms for which at least one one-year-ahead forecast of cash flows or earnings was made during the year. Panel B shows the I/B/E/S sector classification for the firms with valid cash flow and earnings forecasts.

[a] Percent of firms with an earnings forecast that also have a cash flow forecast.

[b] Industry groups are based on I/B/E/S sector classifications.

TABLE 3
Comparison of the Accuracy of Analysts' Cash Flow Forecasts, Analysts' Earnings Forecasts, and Cash Flow Forecasts Derived from the Time-Series Model

Panel A: Beginning-of-Year Forecasts (n = 4,766)[a]

	Absolute Error[b]				Squared Error[b]			
Type of Forecast	**Mean**	**Q1**	**Median**	**Q3**	**Mean**	**Q1**	**Median**	**Q3**
(1) Analysts' Cash Flow Forecasts	0.578	0.110	0.261	0.534	0.890	0.027	0.150	0.596
(2) Analysts' Earnings Forecasts	0.535	0.067	0.181	0.459	0.359	0.005	0.036	0.189
(3) Time-Series Model	0.713	0.114	0.256	0.516	0.789	0.027	0.141	0.533
Difference: (1) − (2)	0.043		0.080		0.531		0.114	
(p-value)	(0.083)		(< 0.001)		(< 0.001)		(< 0.001)	
Difference: (1) − (3)	−0.135		0.005		0.100		0.009	
(p-value)	(< 0.001)		(0.461)		(0.053)		(0.235)	

Panel B: End-of-Year Forecasts (n = 6,817)[a]

	Absolute Error[b]				Squared Error[b]			
Type of Forecast	**Mean**	**Q1**	**Median**	**Q3**	**Mean**	**Q1**	**Median**	**Q3**
(1) Analysts' Cash Flow Forecasts	0.502	0.079	0.208	0.482	0.760	0.012	0.080	0.412
(2) Analysts' Earnings Forecasts	0.142	0.012	0.035	0.108	0.042	0.000	0.001	0.009
(3) Time-Series Model	0.744	0.119	0.267	0.548	0.819	0.028	0.147	0.539
Difference: (1) − (2)	0.360		0.173		0.719		0.079	
(p-value)	(< 0.001)		(< 0.001)		(< 0.001)		(< 0.001)	
Difference: (1) − (3)	−0.242		−0.059		−0.059		−0.067	
(p-value)	(< 0.001)		(< 0.001)		(< 0.001)		(< 0.001)	

(*continued on next page*)

TABLE 3 (continued)

Panel C: Beginning-of-Year Forecasts, by Year and Subperiod

		Analysts' Cash Flow Forecasts				Analysts' Earnings Forecasts			
		Absolute Error		Squared Error		Absolute Error		Squared Error	
Year	**n**	**Mean**	**Median**	**Mean**	**Median**	**Mean**	**Median**	**Mean**	**Median**
1993	72	0.369	0.104	0.490	0.013	0.260	0.116	0.110	0.006
1994	303	0.394	0.103	0.523	0.017	0.276	0.100	0.088	0.005
1995	459	0.228	0.082	0.313	0.011	0.288	0.086	0.103	0.005
1996	499	0.291	0.085	0.430	0.012	0.231	0.076	0.076	0.004
1997	530	0.359	0.103	0.393	0.017	0.280	0.071	0.078	0.003
1998	472	0.409	0.140	0.673	0.031	0.288	0.090	0.114	0.005
1999	664	0.659	0.250	1.208	0.103	0.249	0.059	0.099	0.003
2000	788	0.596	0.233	1.197	0.115	0.164	0.042	0.049	0.002
2001	434	0.644	0.138	1.103	0.037	0.189	0.040	0.076	0.001
2002	1,044	0.528	0.221	0.941	0.075	0.143	0.035	0.036	0.001
2003	1,609	0.526	0.222	0.871	0.091	0.132	0.034	0.041	0.001
2004	1,775	0.480	0.237	0.768	0.090	0.140	0.035	0.045	0.001
2005	1,903	0.504	0.212	0.992	0.086	0.132	0.038	0.042	0.002
Subperiod:									
1993–1999	2,999	0.405	0.119	0.627	0.022	0.267	0.078	0.093	0.004
2000–2006	7,553	0.524	0.219	0.934	0.086	0.142	0.036	0.044	0.001
Difference across subperiods (t-values for the mean and Z-values for the median)		0.119 (5.43)	0.100 (15.10)	0.307 (4.95)	0.064 (16.80)	−0.125 (−10.91)	0.064 (−15.90)	−0.049 (−6.31)	−0.003 (−13.20)

This table reports statistics on the accuracy of analysts' cash flow forecasts relative to that of analysts' earnings forecasts and forecasts generated from a time-series model. Accuracy is defined as the absolute and the squared values of the forecast error. The cash flow forecast generated by the time-series model is based on the regression:

$$CF_t = \varphi_0 + \varphi_1 CF_{t-1} + \varphi_2 \Delta AR_{t-1} + \varphi_3 \Delta INV_{t-1} + \varphi_4 \Delta AP_{t-1} + \varphi_5 DEP_{t-1} + \varphi_6 Other_{t-1} + \varepsilon_t.$$

Statistics in Panel A (Panel B) report comparisons based on the consensus forecast issued at the beginning (end) of the year. The analysis in this table is restricted to observations for which all three measures are available. All variables are truncated at the top percentile.

[a] Observations must have all three forecasts available to participate in the analysis.

[b] Absolute Error = $|A_{it} - F_{it}|$ and Squared Error = $(A_{it} - F_{it})^2$; both error terms are standardized by $|A_{it}|$.

differences are significant at the 1 percent significance level (with the exception of the mean absolute error which is significant at the 8 percent significance level).

Panel B of Table 3 shows the accuracy results for the end-of-year forecasts. Analysts' forecasts of both cash flows and earnings are more accurate at year-end than at the beginning of the year, as expected given the additional information available in the interim. However, year-end cash flow forecasts are still significantly less accurate than contemporaneous earnings forecasts. The mean (median) squared error of analysts' cash flow forecasts is 0.760 (0.080), considerably larger than the comparable statistics for analysts' earnings forecasts, 0.042 (0.001). Absolute errors produce comparable results. All differences are significant at the 1 percent level.[11]

While analysts' cash flow forecasts are significantly less accurate than their earnings forecasts, they generally outperform a mechanical time-series model. Note that for both the beginning-of-year and end-of-year forecasts shown in Panels A and B, respectively, analysts' forecasts of cash flows are more accurate than the forecasts produced by the time-series model. This is particularly true for the end-of-year forecasts, where all differences are statistically significant (see the last line of Panel B) because the time-series model's predictions are not updated over the year.

Effect of Learning and Self-Selection on Accuracy

One explanation for the lower accuracy of analysts' cash flow forecasts as compared to their earnings forecasts is that cash flow forecasts are a relatively new product that requires a learning period by analysts. The inaccuracy of analysts' forecasts in the early period, as they were gaining experience in predicting cash flows, may obscure greater accuracy in more recent years.

Another explanation for the lower accuracy of cash flow forecasts is that these forecasts are more likely demanded (and supplied) in cases where the forecasting of cash flows is more difficult. If this "self-selection" explanation holds, then we would expect this effect to be more pronounced in the early years, when cash flow forecasts were available for relatively few firms (presumably those for which cash flow forecasting was most challenging) and less pronounced in recent years when these forecasts are much more widespread.

To test the validity of both explanations, we analyze the accuracy results by year. The results, reported in Panel C of Table 3, do not support either of these explanations. Note that the accuracy of analysts' cash flow forecasts has actually declined over time. In contrast, the accuracy of analysts' earnings forecasts has improved over the same period, making the difference in their relative accuracy even more pronounced in recent years.

Effect of Variability of the Cash Flow and Earnings Series on Forecasting Accuracy

Another possible explanation for the higher error in analysts' cash flow forecasts relative to their earnings forecasts is the greater inherent variability of the cash flow series. We examine this explanation by comparing the variability of the two time-series for a subset of our sample firms that have at least ten years of cash flow and earnings data on Compustat in the 1993–2005 sample period. For each firm, we compute the variance of its cash flow and earnings distribution, deflated, alternatively, by assets and price at year-end. As shown in Table 4, the variance of the cash flow series is generally larger than that of the earnings series. For 56.8 percent (65.6 percent) of the firms, the variance of the cash flow series deflated by assets (price) is higher than the variance of the respective earnings series.[12] When scaled by assets, the median ratio between the cash flow and earnings variance is 1.18, with an inter-quartile range of 0.56 to 2.56. When price is used as the deflator, the median ratio is 1.81 with an inter-quartile range of 0.63 to 4.44. The mean values of the ratios, 5.69 and 8.62 when deflated by assets and price, respectively, are considerably higher than the median values, reflecting the presence of extreme values in the cash flow series.

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[11] The relative accuracy of analysts' earnings and cash flow forecasts may be affected by the fact that there are generally more analysts who forecast earnings than who forecast cash flows. Thus, there may be more feedback and benchmarking for earnings forecasters than for cash flow forecasters. We test whether the difference between the accuracy of cash flow and earnings forecasts remains significant for a subsample of firm-years in which the number of analysts forecasting only earnings but not cash flows is small (zero to three analysts). The results (untabulated) show that while the accuracy of both cash flow and earnings forecasts improves as the total number of forecasters increases, the difference in the accuracy of the cash flow and earnings forecasts remains significant for this subsample.

The greater variability of the actual cash flow series, however, cannot fully explain the lower accuracy of the cash flow forecasts. Granted, the cash flow series is more volatile and, as noted above, the median ratio of the variance of the cash flow series to the variance of the earnings series is 1.18 (1.81) when the series is deflated by assets (price). However, the mean value of the ratio between the squared error of cash flows forecasts to the squared

TABLE 4

Distribution of the Variance of the Time-Series of Cash Flows and Earnings and the Variance-Deflated Forecast Errors

Panel A: Distribution of the Time-Series Variance of the Variables

Variance	Mean	Quartile 1	Median	Quartile 3	% of Firms with a Ratio above 1.0
Standardized by Assets (n = 1,533 firms)					
Cash Flow Per Share	7.02	1.01	2.53	6.35	
Earnings Per Share	13.75	0.58	1.85	7.35	
Ratio of Cash Flow Variance to Earnings Variance	5.69	0.56	1.18	2.56	56.8%
Standardized by Price (n = 1,359)					
Cash Flow Per Share	72.56	1.04	3.11	10.56	
Earnings Per Share	380.80	0.38	1.39	10.26	
Ratio of Cash Flow Variance to Earnings Variance	8.62	0.63	1.81	4.44	65.6%

Panel B: Distribution of the Squared Error Deflated by the Variance of the Variable over Time[a]

	Mean	Quartile 1	Median	Quartile 3
Cash Flow Per Share (n = 5,142 firm-years)	1.15	0.02	0.15	0.78
Earnings Per Share (n = 5,590 firm-years)	0.04	0.00	0.00	0.01

This table reports statistics on the variance of the cash flow per share and earnings per share series, standardized either by assets per share or the year-end price, as well as on the variance-deflated forecast errors. Firms in the main sample must have at least ten years of data on actual cash flows and earnings to participate in the analysis. All variances are multiplied by 1,000.

[a] The squared error deflated by the variance over time is computed as $(A_{it} - F_{it})^2/\text{Variance}$.

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[12] For the sample firms, the variance of the cash flow and earnings series are highly correlated. The Spearman correlation coefficients are 0.71 and 0.74, respectively, when scaled by assets and price; comparable Pearson correlation coefficients are 0.56 and 0.38.

error of the earnings forecast is considerably higher.[13] Specifically, the ratio between the median squared errors of these two variables is over 4.0 (0.150/0.036, see Panel A of Table 3) for beginning-of-year forecasts and 80.0 (0.080/0.001, see Panel B of Table 3) for end-of-year forecasts.

We also test the effect of the two series' variance on the forecast errors directly by using the variance-deflated squared errors. As Panel B of Table 4 shows, the mean (median) of the squared errors deflated by the time-series variance is still much higher for the cash flow forecasts, 1.15 (0.15), than for the earnings forecasts, 0.04 (0.00).

Effect of Data Quality on Accuracy

Another explanation for the differential accuracy of analysts' earnings and cash flow forecasts is the possibility of a difference in the measurement errors in the forecasted and actual values of the two variables. In computing the forecast error, the forecast amount and the actual, or realized, values should conform to the same definition. However, analysts' earnings forecasts do not always conform to the GAAP definition of earnings because analysts often exclude from their forecasts certain items that are considered transitory or otherwise unrelated to the "core" earnings of the company. Likewise, analysts' cash flow forecasts may exclude certain items that are included in cash flows from operating activities under GAAP.[14] In reporting the "actual" cash flows, I/B/E/S adheres to the same rule that it applies in reporting actual earnings by excluding from the actual number any item excluded by the majority of the analysts. However, because the number of contemporaneous analysts' cash flow forecasts is much smaller than the number of earnings forecasts (a median of 6 versus 11 forecasts per firm for the sample, as reported in Table 2, Panel A) and the idiosyncratic nature of the exclusions by different analysts, implementing this "majority rule" may result in an I/B/E/S value of actual cash flows that is not comparable with a significant proportion of the individual analysts' forecasts.

Further, in many cases, I/B/E/S actual numbers are unavailable. Table 5 provides statistics on the availability of actual cash flow data and its effects on the accuracy of the cash flow forecasts at the beginning and end of the year. Since most of the conclusions for the two groups of forecasts are similar, we focus on the results in Panel B that pertain to the end-of-year forecasts. Of the 10,884 firm-years for which consensus end-of-year forecasts could be constructed and actual cash flow numbers were available, only 5,748 (52.8 percent) have an actual cash flow number available on I/B/E/S. For the remaining 5,136 (47.2 percent) firm-years, actual cash flow figures are available on Compustat only (data item [308]). In 2,255, or about 21 percent of the 10,884 total available observations, actual cash flow figures are missing from Compustat. This percentage, while high, is similar (and even somewhat lower) to the percentage of missing actual earnings data (24 percent) that we find for the same firms and years on Compustat.

There are 3,493 firm-years for which actual cash flow numbers are available from both sources. However, only in 123 of these cases are the I/B/E/S and Compustat actual amounts identical. That is, a discrepancy exists between the actual values provided by I/B/E/S and by Compustat (GAAP) in more than 96.5 percent of the cases.

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[13] The predictability of a variable and its variability are positively related. To see this, consider for example an autoregressive behavior of earnings over time of the form: $E_t = \alpha + \beta (E_{t-1}) + e_t$, where E is the earnings variable. $Var(e)$ can be viewed as a predictability measure. Assuming further that the variance of earnings is stationary over time, earnings variability and predictability are related, $Var(e) = Var(E) * (1 - \beta^2)$. Dichev and Tang (2009) elaborate further on this relation.

[14] A similar lack of uniformity in the definition of the forecasted cash flows is reported by Cao et al. (2007) for *management* cash flow forecasts.

TABLE 5
Accuracy of Analysts' Cash Flow Forecasts Conditional on Availability of Actual Cash Flow Numbers

Panel A: Beginning-of-Year Forecasts

Line		No. of Obs.	Absolute Error[a]		Squared Error[a]	
			Mean	Median	Mean	Median
1	All Observations	7,543[b]	0.603	0.258	1.143	0.138
	Observations with actual cash flow amount available:					
2	On I/B/E/S	4,146	0.476	0.205	0.768	0.088
3	Only on Compustat but not on I/B/E/S	3,379	0.753	0.340	1.601	0.233
4	Only on I/B/E/S but not on Compustat	1,619	0.440	0.191	0.723	0.061
	On both I/B/E/S and Compustat[c]					
5a	Errors are based on I/B/E/S actual amounts	2,527	0.500	0.211	0.797	0.109
5b	Variance-deflated errors[d]	1,825			1.099	0.206
6	Errors are based on Compustat actual amounts	2,527	0.674	0.272	1.548	0.179
	Earnings forecast errors based on:					
7a	I/B/E/S actual amounts	2,480	0.572	0.176	0.426	0.037
7b	Variance-deflated errors[d]	1,953			0.332	0.047

Panel B: End-of-Year Forecasts

Line		No. of Obs.	Absolute Forecast Error[a]		Squared Forecast Error[a]	
			Mean	Median	Mean	Median
1	All Observations	10,884	0.506	0.191	0.965	0.064
	Observations with actual cash flow amount available:					
2	On I/B/E/S	5,748	0.385	0.120	0.687	0.026
3	Only on Compustat but not on I/B/E/S	5,136	0.641	0.286	1.276	0.146
4	Only on I/B/E/S but not on Compustat	2,255	0.310	0.089	0.506	0.010
	On both I/B/E/S and Compustat[c]					
5a	Errors are based on I/B/E/S actual amounts	3,493	0.434	0.145	0.804	0.044
5b	Variance-deflated errors[d]	2,441			0.910	0.099
6	Errors are based on Compustat actual amounts	3,493	0.591	0.242	1.301	0.116
	Earnings forecast errors based on:					
7a	I/B/E/S actual amounts	3,455	0.140	0.031	0.051	0.001
7b	Variance-deflated errors[d]	2,627			0.036	0.001

(*continued on next page*)

TABLE 5 (continued)

This table reports statistics on the accuracy of analysts' cash flow forecasts for different subsamples based on data availability. Accuracy is defined as the absolute and the squared values of the forecast errors.

[a] Absolute forecast error = $|A_{it} - F_{it}|$, Squared forecast error = $(A_{it} - F_{it})^2$; both error measures are standardized by $|A_{it}|$.

[b] Number of firm-years for which beginning-of-year consensus cash flow forecasts can be constructed and data on the actual cash flow amounts are available. (This restriction reduces the sample below that consisting of firm-years with at least one cash flow forecast, 19,522, as reported in Table 2.)

[c] The actual amounts reported by Compustat and I/B/E/S are identical for only 123 firm-years.

[d] Variance-deflated errors equal the absolute or squared errors divided by the variance of the variable (cash flow or earnings) over time.

Our finding that a discrepancy is present in almost all of the cases is much higher than that documented by past studies of GAAP earnings as compared with I/B/E/S earnings. Dolye et al. (2003) find that a discrepancy due to exclusions of certain items from analysts' earnings forecasts (and hence I/B/E/S) exists in about 20 percent of the firms. For a slightly different time period, Abarbanell and Lehavy (2007) document that a discrepancy in the actual earnings provided by Compustat and I/B/E/S is present in about 48 percent of the firms, still considerably lower than that present for the cash flow data.[15]

Given the discrepancy between the actual values reported by Compustat and I/B/E/S, our use of the Compustat actual amounts to determine the accuracy of the cash flow forecasts when the I/B/E/S actual amounts are missing tends to inflate the magnitude of the measured forecast error. Indeed, as Table 5 shows, for firm-years where I/B/E/S actual amounts are available, their use rather than use of the Compustat actual numbers results in lower forecast errors. For example, for the beginning-of-year forecasts reported in Panel A (lines 5a and 6), the mean (median) squared error when I/B/E/S is used is 0.797 (0.109) as compared with 1.548 (0.179) when actual values are taken from Compustat. However, even for the cases where I/B/E/S actual values are used to determine the cash flow forecast error, the squared error, whose mean (median) is 0.768 (0.088) (line 2), is still higher than the error of analysts' earnings forecasts of 0.426 (0.037) (line 7a).

The finding that earnings forecast errors are considerably smaller than the corresponding cash flow forecast errors even when we control for measurement errors in the data by considering only cases with I/B/E/S actual amounts is also quite pronounced for both error measures for end-of-year forecasts (see Panel B). This suggests that our use of the Compustat actual number for cases where the I/B/E/S actual number is unavailable does not fully explain the higher forecast errors of cash flow forecasts relative to earnings forecasts.

Next, in addition to controlling for possible measurement errors, we control for the variability in the time-series of cash flows and earnings by deflating the forecast errors by the variance of the respective series. The results presented on lines 5b and 7b in Panels A and B of Table 5 show that, after controlling for both data availability (by restricting the examination to cases where I/B/E/S actual values are available) and the inherent variability in the respective variable (by deflating the squared error by the variance of the variable), cash flow forecasts are still less accurate than earnings forecasts. For example, for the beginning-of-year cash flow forecast errors computed using I/B/E/S actual values, the mean (median) variance-deflated error is several times larger than its earnings counterpart 1.099 (0.206) versus 0.332 (0.047) (Panel A, lines 5b and 7b).

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[15] The magnitude of the discrepancy for our sample firms (not tabulated) is quite large. The mean (median) absolute difference between the two actual cash flow values deflated by the absolute value of the Compustat actual amount is 0.534 (0.221).

The greater accuracy of earnings forecasts over that of cash flow forecasts is even more pronounced for end-of-year forecasts (see Panel B of Table 5), suggesting a deterioration in the relative accuracy of cash flow forecasts as compared with earnings forecasts as the year progresses, a finding we explore later in the study.

Accuracy of Cash Flow Forecasts for Select Subsamples

We also examine the accuracy of cash flow forecasts for select subsamples with characteristics that are likely to affect forecasting accuracy. Specifically, we replicate the accuracy tests in Table 3 for: (1) firm-years in which the consensus cash flow forecast is based on at least three analysts' forecasts, (2) only firm-years in which a profit is reported, (3) growth firms (defined as those in the bottom one-third of the distribution of the book-to-market ratio), and (4) larger firms (defined as those in the top one-third of the distribution of the market-value-of-equity ratio). Results (untabulated) suggest that the cash flow forecasts for these subsamples, while still performing well below their earnings forecast counterparts, exhibit a greater, and sometimes considerably greater, accuracy than the universe of cash flow forecasts. For example, the median absolute error (median squared error) for the beginning-of-year cash flow forecasts for the four subsamples are 0.221 (0.125), 0.234 (0.134), 0.237 (0.105), and 0.198 (0.105), respectively, consistently lower than that of the beginning-of-year cash flow forecasts for the full sample of 0.261 (0.150) as reported in Panel A of Table 3.

Bias and Efficiency

The extent of bias in analysts' cash flow forecasts, their earnings forecasts, and the time-series model is shown in Table 6.[16] The table confirms an optimistic bias in analysts' *earnings forecasts* at the beginning of the year. The mean bias, measured as the difference between the actual and forecasted earnings amounts deflated by the absolute value of actual earnings (or by price) is −0.306 (−0.265) (line 2). This bias dissipates considerably by the end of the year to −0.020 (−0.029) (line 5). Interestingly, the median bias (deflated by the absolute value of actual earnings) in analysts' earnings forecasts is close to zero at the beginning of the year (0.003), with errors distributed almost evenly around zero. The median error becomes slightly more positive (0.009) reflecting more pessimistic forecasts or attempts by firms to manage earnings so as to beat expectations at year-end, with 58 percent of the errors being positive (line 5). The results for the cash flow forecasts are less conclusive and depend on the deflator used. When deflated by price, the cash flow forecasts exhibit pessimistic bias both at the beginning and the end of the year. When the absolute value of the actual amount is the deflator, the mean bias indicates optimism, yet the median bias suggests slight pessimism.

Analysts' *cash flow forecasts* suffer as well from a beginning-of-year bias, with a mean error of −0.249. Yet, in contrast to the earnings forecasts, a large proportion of this bias remains at year-end, as evidenced by the mean error of −0.136. This likely indicates less frequent updating of cash flow forecasts relative to earnings forecasts, consistent with the descriptive statistics on the number of earnings versus cash flow forecasts produced, as shown in Table 2, and the findings on the intra-year forecast improvement reported in the

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[16] Observations in this analysis were required to have all three forecasts available for a given firm-year. Similar results are obtained when this restriction is lifted and all observations available for each model are examined.

TABLE 6

Bias in Analysts' Cash Flow Forecasts, Analysts' Earnings Forecasts, and Cash Flow Forecasts Derived from the Time-Series Model[a]

			Sign of Forecast Error			Bias Deflated by Absolute Value of the Actual Amount				Bias Deflated by Price (× 100)			
Time of Forecast	Line	Type of Forecast	% Pos.	% Neg.	% Zero	Mean	Q1	Median	Q3	Mean	Q1	Median	Q3
Beginning-of-Year[b]	1	Analysts' Cash Flow	55.6	44.2	0.2	−0.249	−0.253	0.048	0.261	0.911	−2.272	0.436	3.312
	2	Analysts' Earnings	50.3	48.7	1.0	−0.306	−0.258	0.003	0.135	−0.265	−1.104	0.017	0.836
	3	Time-Series Model[d]	51.1	48.9	0.0	−0.447	−0.348	0.018	0.218	−0.866	−2.568	0.081	2.074
End-of-Year[c]	4	Analysts' Cash Flow	57.8	41.7	0.5	−0.136	−0.156	0.041	0.235	0.895	−1.293	0.359	2.427
	5	Analysts' Earnings	58.0	33.7	8.3	−0.020	−0.020	0.009	0.045	−0.029	−0.090	0.044	0.226
	6	Time-Series Model[d]	51.7	48.3	0.0	−0.444	−0.362	0.018	0.225	−0.672	−2.480	0.125	2.244

This table reports statistics on the bias in analysts' cash flow forecasts, analysts' earnings forecasts, and forecasts generated from the time-series model. All variables are truncated at the top and bottom percentile.

[a] $Bias_{it} = (A_{it} - F_{it})$. Bias is scaled, alternatively, by the absolute value of the actual value and the price at the beginning of the period.

[b] No. of observations equals 4,697 (4,651) when bias is deflated by the absolute value of the actual amount (price).

[c] No. of observations equals 6,734 (6,680) when bias is deflated by the absolute value of the actual amount (price).

[d] $CF_{it} = \varphi_0 + \varphi_1 CF_{it-1} + \varphi_2 \Delta AR_{it-1} + \varphi_3 \Delta INV_{it-1} + \varphi_4 \Delta AP_{it-1} + \varphi_5 DEP_{it-1} + \varphi_6 Other_{it-1} + \varepsilon_{it}$ (Equation (5)).

next section. The time-series model exhibits a much greater bias than that present in analysts' cash flow or earnings forecasts, with a beginning- (end-) of-year mean error of −0.447 (−0.444) (lines 3 and 6, respectively).

The results of the efficiency tests (untabulated) indicate that both cash flow and earnings forecasts exhibit significant serial correlation. However, the serial correlation between successive cash flow forecast errors is larger than that between successive earnings forecast errors (0.145 versus 0.096). This finding suggests that cash flow forecasts are less efficient than earnings forecasts and could be improved if analysts properly adjusted for past errors.

Intra-Year Improvement

Table 7 shows the rate of reduction in the forecast error over the forecast year, measured from the beginning-of-year to the end-of-year forecast. As the results show, the frequency and rate of improvement are much higher for earnings forecasts than for cash flow forecasts. The accuracy of cash flow forecasts improves over the year for 63.6 percent (64.0 percent) of the cases when considering the absolute (squared) errors, whereas the corresponding percentage of firms with an improvement in their earnings forecasts is 83.5 percent (83.6 percent). Further, the median rate of improvement in cash flow forecasts over the forecast year is 0.250 for the absolute error and 0.448 for the squared error, much lower than the median improvement rates for the earnings forecasts of 0.756 and 0.941, respectively.

These results are consistent with the overall lower quality of cash flow forecasts and suggest that analysts take less care with, and invest fewer resources in, improving their cash flow forecasts during the forecast period as compared with their earnings forecasts. The relative lack of improvement over the year in cash flow forecasts is also consistent with the finding reported earlier that, after controlling for other factors that dampen the accuracy of cash flow forecasts (i.e., the more limited availability of I/B/E/S actual amounts and the higher variability of the cash flow series relative to the earnings series), cash flow forecasts are of a lower accuracy than earnings forecasts.

Sophistication of Analysts' Cash Flow Forecasts

Table 8 compares end-of-year forecast errors of analysts' cash flow forecasts with those of naïve cash flow forecasts (computed as analysts' earnings forecast plus the amount of depreciation and amortization in the forecasted year as specified in Equation (6)). Strikingly, the mean difference in the analysts' and the naïve cash flow forecast errors is small and insignificant (and not always in favor of the analysts), indicating a lack of sophistication of the analysts' forecasts. For example, the mean squared error deflated by the absolute value of the actual cash flow amount is 0.932 for analysts and 0.892 for the naïve model, an insignificant difference.

Table 9 contains the correlation coefficients between the forecast errors of analysts' cash flow forecasts, analysts' earnings forecasts, and naïve cash flow forecasts (computed as specified in Equation (6)).[17] There is a strong positive correlation between the errors of analysts' cash flow forecasts and the errors produced by the naïve cash flow forecasts (Pearson and Spearman correlation coefficients of 0.771 and 0.612, respectively). Since the naïve cash flow forecasts are based on analysts' earnings forecasts, the high correlation between these forecast errors and analysts' cash flow forecasts could reflect commonality in the errors in forecasting earnings and cash flows. However, as shown in the rightmost column of the table, the correlation between the errors in analysts' cash flow and earnings

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[17] The results presented are based on the errors deflated by the absolute value of the actual values. Similar results are obtained when the errors are deflated by price.

TABLE 7
Intra-Year Improvement in the Accuracy of Analysts' Cash Flow and Analysts' Earnings Forecasts

Type of Analysts' Forecasts	Error Measure[b]	Percentage of Cases with Improved Forecasts	Rate of Improvement[c] Quartile 1	Rate of Improvement[c] Median	Rate of Improvement[c] Quartile 3
Cash Flow Forecasts	Absolute forecast errors	63.6%	−0.333	0.250	0.713
(n = 7,375[a])	Squared forecast errors	64.0%	−0.742	0.448	0.920
Earnings Forecasts	Absolute forecast errors	83.5%	0.358	0.756	0.917
(n = 9,140[a])	Squared forecast errors	83.6%	0.587	0.941	0.993

This table reports statistics on the intra-year improvement in analysts' cash flow and earnings forecast accuracy. All variables are truncated at the top percentile.

[a] Observations have both beginning-of-year and end-of-year earnings and cash flow forecasts.

[b] Absolute forecast error = $|A_{it} - F_{it}|$, Squared forecast error = $(A_{it} - F_{it})^2$; both error measures are standardized by $|A_{it}|$.

[c] Rate of Improvement = $1 - (\text{Error}_{i,\text{END}(t)}/\text{Error}_{i,\text{BEG}(t)})$.

forecasts is considerably lower (Pearson and Spearman correlation coefficients of 0.047 and 0.099, respectively), suggesting that the high correlation between analysts' earnings and cash flow forecasts arises because analysts' cash flow forecasts are a naïve extrapolation of their earnings forecasts.

Table 10 shows the results of estimating Regression (7), in which analysts' cash flow forecasts are the dependent variable and the independent variables are analysts' earnings forecasts, depreciation and amortization, the net change in working capital accounts, and other adjustments to income made in deriving cash flow from operations. The regression is estimated alternately for beginning-of-year and end-of-year cash flow and earnings forecasts. The values of the adjustments to income (e.g., depreciation and amortization) are the realized values for the forecast year.[18]

If analysts' cash flow forecasts are consistent with their earnings forecasts and if analysts consider correctly the various adjustments to net income needed to compute cash flow from operations, then we would expect all independent variables to have a positive and significant coefficient that is not significantly different from 1.0. Panel A of Table 10 shows the results using the beginning-of-year forecasts. The cash flow forecasts are consistent with the earnings forecasts as indicated by the coefficients on the earnings forecasts, which are very close to 1.0 and significant. This is also true for the coefficients for depreciation and amortization, suggesting that, in producing their cash flow forecasts, analysts add back depreciation and amortization to their earnings forecasts. The coefficients for the net change in working capital and the other adjustments are also significant and positive. However, their value (ranging from 0.058 to 0.064) is far below 1.0, the level that would be expected if analysts fully and correctly incorporate these adjustments. These low coefficients are consistent with analysts either largely ignoring these adjustments in generating their cash

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[18] We implicitly assume perfect foreknowledge of these realized values since they are unknown to the analyst at the time the forecast is made. Estimation of Regression (7) using the current year values for these variables produces very similar results, suggesting that the above assumption is not critical to our findings.

TABLE 8
Performance of Analysts' Cash Flow Forecasts versus Naïve Cash Flow Forecasts

	Absolute Error[a]		Squared Error[a]	
Type of Forecast	**Mean**	**Median**	**Mean**	**Median**
Analysts' Cash Flow Forecasts	0.533	0.217	0.932	0.086
Naïve Cash Flow Forecasts[b]	0.544	0.212	0.892	0.091
Difference[c]	−0.011	0.005	0.040	−0.005

This table compares the absolute and squared errors of analysts' cash flow forecasts to those derived from a naïve forecast model. Analysts' forecasts are based on the consensus cash flow forecast at the end of the year. All variables are truncated at the top percentile. The table is based on 8,010 observations (firm-years) with available data to form the naïve forecast, out of the total 10,884 firm years for which cash flow forecasts and actual cash flow are available.

[a] Absolute forecast error = $|A_{it} - F_{it}|$, Squared forecast error = $(A_{it} - F_{it})^2$; both error measures are standardized by $|A_{it}|$.

[b] The naïve cash flow forecasts are computed as $F(CF_{it}) = F(Earnings_{it}) + DEP_{it}$ where $F(Earnings)$ is analysts' consensus earnings forecast and *DEP* is the amount of depreciation on a per share basis (Equation (6)).

[c] All differences are statistically insignificant.

TABLE 9
Correlation Coefficients between Forecast Errors[a]

	Analysts' Cash Flow Forecast Errors	Naïve Cash Flow[b] Forecast Errors	Analysts' Earnings Forecast Errors
Analysts' Cash Flow Forecast Errors	1.000	0.771	0.047
Naïve Cash Flow Forecast Errors[c]	0.612	1.000	0.063
Analysts' Earnings Forecast Errors	0.099	0.089	1.000

This table reports the Pearson (above the diagonal) and Spearman (below the diagonal) correlation coefficients between the signed errors deflated by the absolute value of the actual amount for analysts' forecasts of cash flows, naïve cash flow forecasts, and analysts' forecast of earnings, $(A_{it} - F_{it})/|A_{it}|$. All variables are truncated at the top percentile.

[a] The number of observations varies from 6,647 to 10,295 depending on the cell.

[b] The naïve cash flow forecasts are computed as $F(CF_{it}) = F(Earnings_{it}) + DEP_{it}$ where $F(Earnings)$ is analysts' consensus earnings forecast and *DEP* is the amount of depreciation on a per share basis (Equation (6)).

flow forecasts or significantly under-adjusting for these factors, potentially due to the difficulty in forecasting changes in working capital (relative to forecasting depreciation). The adjusted R^2 values convey the same message. Analysts' beginning-of-year earnings forecasts explain 50.7 percent of the variability in their cash flow forecasts. Including the depreciation and amortization expense in the regression increases the adjusted R^2 significantly, to 76.5 percent. In contrast, the addition of the working capital and the other adjustments leaves the explanatory power of the regression virtually intact.

The same results characterize the end-of-year forecasts, as shown in Panel B of Table 10. Even at year-end, analysts either poorly predict the forthcoming change in working capital and the magnitude of other adjustments, or otherwise do not incorporate this information in their forecasts efficiently.

TABLE 10
Sophistication of Analysts' Cash Flow Forecasts

Panel A: Beginning-of-Year Cash Flow Forecasts (n = 3,719)

Coefficients (t-statistics)

Intercept	**Analysts' Earnings Forecasts**	***DEP***	**ΔWC**	**Other**	**Adjusted R^2**
0.059 (51.8)	0.907 (61.9)				50.7%
−0.03 (−2.0)	0.951 (93.7)	1.045 (63.8)			76.5%
−0.002 (−1.7)	0.954 (93.6)	1.042 (63.7)	0.058 (3.3)		76.6%
−0.003 (−2.2)	0.952 (93.7)	1.038 (63.5)	0.064 (3.7)	0.060 (4.7)	76.7%

Panel B: End-of-Year Cash Flow Forecasts (n = 5,348)

Coefficients (t-statistics)

Intercept	**Analysts' Earnings Forecasts**	***DEP***	**ΔWC**	**Other**	**Adjusted R^2**
0.059 (51.0)	0.886 (84.8)				57.3%
0.003 (2.0)	0.911 (109.7)	0.977 (56.1)			73.2%
0.003 (2.4)	0.916 (109.3)	0.974 (56.0)	0.070 (4.1)		73.2%
0.001 (0.8)	0.918 (110.6)	0.968 (56.1)	0.086 (5.0)	0.129 (20.1)	73.7%

This table reports coefficient estimates and t-statistics (in parentheses) of estimating Regression (7):

$$F(CF_{it}) = \gamma_0 + \gamma_1 F(Earnings_{it}) + \gamma_2 DEP_{it} + \gamma_3 \Delta WC_{it} + \gamma_4 Other_{it} + \eta_{it}.$$

Analyst earnings forecasts are the consensus forecasts at the beginning (Panel A) and end of the year (Panel B). Depreciation and amortization (*DEP*) is Compustat data item 125. Change in working capital (ΔWC) is equal to the sum of Compustat data items 302, 303, 304. Other adjustments, *Other*, is equal to Compustat data item 308 minus the sum of Compustat data items 123, 125, 302, 303, 304. All variables are deflated by average total assets and are truncated at the top and bottom percentiles.

The finding that analysts' cash flow forecasts provide little incremental information beyond their earnings forecasts suggests that investors can easily replicate these forecasts. Nonetheless, the finding by previous research that analysts produce these forecasts in response to investor demand (e.g., DeFond and Hung 2003) may still be valid. Our results suggest only that, while analysts might respond to what they perceive to be investor demand, the type of cash flow forecasts they produce does not fully meet this demand.

Similarly, another finding by previous research, namely that the existence of a cash flow forecast affects management reporting behavior (e.g., McInnis and Collins 2008) remains plausible even in the face of the low incremental information contained in these forecasts. By their mere presence, cash flow forecasts, regardless of their inherent quality, could attract investors' attention and thus influence management in determining the firm's reporting policy because, being in the public domain, these forecasts serve as an additional benchmark against which the reported results might be evaluated.

Analysts' Cash Flow Forecasts as a Surrogate for Market Expectations

Using the association between the forecast error and stock price movements as a measure of the information content of the forecast, we compare the information content conveyed by the analysts' consensus cash flow forecasts made at the beginning of the year to that of a mechanical model. Panel A of Table 11 presents the results when cumulative

TABLE 11
Analysts' Cash Flow Forecasts as a Surrogate for Market Expectations

Panel A: Beginning-of-Year Forecasts and Annual Returns (n = 4,485)

Line	Intercept	Analysts' Earnings Forecast Error	Analysts' Cash Flow Forecast Error	Time-Series Model Error[a]	Adjusted R^2
(1)	0.123 (15.6)	0.034 (15.9)			5.31%
(2)	0.105 (13.1)		0.012 (12.2)		3.20%
(3)	0.12 (15.3)			0.010 (9.6)	1.98%
(4)	0.116 (14.3)	0.027 (11.7)	0.006 (6.1)		6.06%
(5)	0.126 (15.9)	0.031 (13.3)		0.047 (4.4)	5.70%
(6)	0.119 (14.8)	0.026 (10.8)	0.006 (5.0)	0.003 (2.8)	6.21%

Panel B: End-of-Year Forecasts and Announcement Period Returns (n = 6,045)

Line	Intercept	Analysts' Earnings Forecast Error	Analysts' Cash Flow Forecast Error	Time-Series Model Error[a]	Adjusted R^2
(1)	0.421 (4.6)	0.262 (3.8)			0.23%
(2)	0.402 (4.4)		0.014 (1.2)		0.01%
(3)	0.427 (4.7)			0.025 (2.2)	0.06%
(4)	0.407 (4.5)	0.262 (3.9)	0.014 (1.2)		0.24%
(5)	0.431 (4.7)	0.251 (3.7)		0.021 (1.8)	0.27%
(6)	0.420 (4.6)	0.251 (3.7)	0.097 (0.8)	0.019 (1.6)	0.26%

This table reports coefficient estimates and t-statistics (in parentheses) of estimating Regression (8):

$$CAR_{it} = \alpha + \beta_1 FE(Earnings_{it}) + \beta_2 FE(CF_{it}) + \varepsilon_{it}.$$

CAR is the cumulative abnormal return for year *t* beginning with the fourth month after the end of fiscal year $t-1$ and ending with the third month following the end of fiscal year *t*. *FE*(*Earnings*) and *FE*(*CF*) are the analysts' forecasts errors for earnings and cash flows, respectively, computed from the beginning-of-the year forecasts deflated by price. The independent variables (the forecast errors) are multiplied by 100 before estimating the regression.

[a] The time-series model is:

$$CF_{it} = \varphi_0 + \varphi_1 CF_{it-1} + \varphi_2 \Delta AR_{it-1} + \varphi_3 \Delta INV_{it-1} + \varphi_4 \Delta AP_{it-1} + \varphi_5 DEP_{it-1} + \varphi_6 Other_{it-1} + \varepsilon_{it}$$

where *CF* is cash flow from operations, ΔAR is the change in accounts receivable, ΔINV is the change in inventory, ΔAP is the change in accounts payable, *DEP* is the amount of depreciation and amortization, and *Other* is all other operating accruals (Equation (5)).

abnormal returns over the year are regressed on the beginning-of-year cash flow and earnings forecast errors deflated by price. The results on line 4 show that the coefficient on $FE(CF_{it})$, the cash flow forecast error, is positive and significant, indicating that, after controlling for unexpected earnings, analysts' cash flow forecasts have information content. However, the incremental information content of cash flow forecasts beyond that of earnings forecasts is marginal, with the adjusted R^2 of the regression increasing only slightly, from 5.31 percent to 6.06 percent, when the cash flow forecast error is included as an additional explanatory variable.

While analysts' cash flow forecasts appear to have greater explanatory power with respect to stock returns relative to the predictions of the mechanical time-series model (an adjusted R^2 of 3.20 percent versus 1.98 percent, see lines 2 and 3, respectively), the incremental information of these forecasts beyond that provided by the earnings forecasts and the mechanical model forecasts is marginal, increasing the adjusted R^2 from 5.70 percent to 6.06 percent (see lines 5 and 4, respectively). Interestingly, even in the presence of the earnings and cash flow forecast error variables, the time-series forecast error coefficient is significant, although its inclusion increases the explanatory power only slightly (the adjusted R^2 increases from 6.06 percent to 6.21 percent, as shown on lines 4 and 6, respectively).

Panel B of Table 11 shows the results regarding the association between the abnormal returns in the short window of the earnings announcement and the end-of-year forecast errors. They indicate that end-of-year analysts' cash flow forecasts are not significantly correlated with stock returns and, in particular, do not have incremental information content beyond that provided by end-of-year earnings forecasts. The results on lines 4 and 5 suggest that, after controlling for earnings information, cash flow information (in the form of forecast errors from either analysts' or the time-series model) is of marginal value.[19]

Use of Analysts' Cash Forecasts to Form an Accruals Expectation Model

As explained in Section IV, we compare the effectiveness of an analyst-based accruals expectation model (whereby expected accruals are inferred from the difference between analysts' earnings and cash flow forecasts) to detect earnings management to that of two commonly used models: the modified Jones model and the Dechow and Dichev (2002) model. The difference between the expected accruals produced by each model and the realized accruals is denoted as "unexpected accruals." We use these values of unexpected accruals to determine the presence of earnings management in two subsamples of observations, one for which earnings management is likely to have occurred and the rest of the sample. Recall that earnings management is assumed to exist when unexpected accruals exceed a multiple (of 1.0, 1.5, or 2.0) times their cross-sectional standard deviation. As noted earlier, three groups comprise the "likely earnings management" observations: firm-years for which there was a downward restatement of earnings, firm-years for which there was a small profit ("just-above zero" earnings defined as those where $0 \leq \text{EPS} \leq 0.02$), and firm-years where there is a small earnings increase relative to the same quarter the previous year ("just-above-zero earnings changes," defined as those where $0 \leq \Delta\text{EPS} \leq 0.01$).[20]

The results on the ability of this analyst-based model to identify earnings management in the form of loss avoidance are presented in Table 12.[21] (For the sake of brevity, we do not tabulate the results for the small earnings increases sample or for the restatement sample since they are quite similar to the small profits sample.) Several findings emerge. First, the performance of all three models is fairly poor. To illustrate, consider the case where earnings management is presumed to exist whenever earnings are just above zero. There are 1,121

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[19] The short window results may somewhat understate the incremental value of cash flow information if investors do not have access to this information on the earnings announcement date. However, as noted by DeFond and Hung (2003), evidence suggests that cash flow information is typically revealed as part of the earnings press release and the accompanying conference call. Similarly, Francis et al. (2002) and Frankel et al. (1999) note that cash flow information is often disseminated to investors through conference calls which typically accompany the earnings announcement. Finally, we obtain similar results when we limit the sample to the post-Regulation FD period when disclosure of both earnings and cash flow information in the earnings announcements is more common.

[20] Using other cut-off points around zero earnings or zero earnings changes produces qualitatively similar results.

[21] The results presented are based on using 1.5 standard deviations as the demarcation point. Similar results are obtained when we use 1.0 or 2.0 standard deviations as the demarcation point.

TABLE 12
Ability of Alternative Accruals Expectation Models to Correctly Detect Earnings Management; Earnings Management is Assumed to Exist When Firms Report Small Profits
($0 \leq$ EPS ≤ 0.02)

			Modified Jones Model Classification[a]	
***A Priori* Determination**	**% in Sample**	**Total**	**Earnings Management**	**No Earnings Management**
Earnings management exists ($0 \leq$ EPS ≤ 2 cents)	3.0	1,121 (100.0%)	94 (4.9%)	**1,027 (91.6%)**
Earnings management does not exist	97.0	35,946 (100.0%)	**1,075 (3.0%)**	34,871 (91.6%)
All firm-years	100.0	37,067	1,169	35,898

Improvement over benchmark[c]:
Type I errors: 3.0% under the benchmark; 3.0% generated by the model (difference of 0.0%)
Type II errors: 97.0% under the benchmark; 91.6% generated by the model (difference of 5.4%)

			Dechow-Dichev Classification[b]	
***A Priori* Determination**	**% in Sample**	**Total**	**Earnings Management**	**No Earnings Management**
Earnings management exists ($0 \leq$ EPS ≤ 2 cents)	3.0	1,971 (100.0%)	80 (4.1%)	**1,891 (95.9%)**
Earnings management does not exist	97.0	64,328 (100.0%)	**1,034 (1.6%)**	63,294 (98.4%)
All firm-years	100.0	66,299	1,114	65,185

Improvement over benchmark[c]:
Type I errors: 3.0% under the benchmark; 1.6% generaged by the model (difference of 1.4%)
Type II errors: 97.0% under the benchmark; 95.9% generated by the model (difference of 1.1%)

			Analyst-Based Classification	
***A Priori* Determination**	**% in Sample**	**Total**	**Earnings Management**	**No Earnings Management**
Earnings management exists ($0 \leq$ EPS ≤ 2 cents)	0.7	58 (100.0%)	4 (6.9%)	**54 (93.1%)**
Earnings management does not exist	99.3	7,880 (100.0%)	**292 (3.7%)**	7,588 (99.3%)
All firm-years	100.0	7,938	296	7,642

Improvement over benchmark[c]:
Type I errors: 0.7% under the benchmark; 3.7% generated by the model (difference of 3.0%)
Type II errors: 99.3% under the benchmark; 93.1% generated by the model (difference of 6.2%)

(Observations are identified as earnings management cases whenever unexpected accruals exceed 1.5 standard deviations of the unexpected accruals distribution. The amounts shown in bold indicate Type I and Type II errors.)

[a] The modified Jones model for deriving expected accruals is estimated from the following cross-sectional regression for each two-digit SIC code industry (the subscripts *i* and *t* denote the firm and time, respectively):

$$TACC_{it}/TA_{it-1} = a_0 + a_1(1/TA_{it-1}) + a_2[(\Delta REV_{it} - \Delta TR_{it})/TA_{it-1}] + a_3(PPE_{it}/TA_{it-1}) + \varepsilon_{it}$$

(*continued on next page*)

TABLE 12 (continued)

where *TACC* is the firm's total accruals, defined as the difference between income from continuing operations and cash flow from operating activities adjusted for extraordinary items and discontinued operations, ΔREV is the change in the firm's revenues, ΔTR is the change in trade receivables, and *PPE* is the amount of gross property, plant, and equipment. All variables are standardized by total assets at the beginning of the year, TA_{t-1}.

[b] The Dechow and Dichev (2002) model for deriving expected accruals is estimated from the following regression:

$$TCACC_{it}/AvTA_{it} = \beta_0 + \beta_1 CFO_{it-1}/AvTA_{it} + \beta_2 CFO_{it}/AvTA_{it} + \beta_3 CFO_{it+1}/AvTA_{it} + \varepsilon_{it}$$

where *TCACC* is total current accruals (equal to the change in current assets excluding cash and short-term investments minus the change in current liabilities excluding the current portion of long-term debt), *CFO* is cash flow from operations, measured as income from continuing operations less total accruals, and *AvTA* is average total assets.

[c] The benchmark predicts "earnings management" for any given firm-year with a probability of p and "no earnings management" with a probability of $1 - p$, where p is the proportion of earnings management in the sample.

such firm-years out of the 37,067 firm-years for which expected accruals could be computed. Based on their positive abnormal accruals, the modified Jones model identifies only 94 of these cases as earnings management cases. It further classifies 1,075 firm-years as earnings management cases when there is no earnings management. Type I and Type II errors for the model are 3.0 percent and 91.6 percent, respectively (the shaded figures in the table). These errors are only slightly lower than those generated from a benchmark model where the prediction of "earnings management" for a given firm-year is made randomly with a probability of p and the prediction of "no earnings management" is made with a probability of $1 - p$, where p is the proportion of earnings management in the population. This model would produce a Type I error of 3.0 percent and a Type II error of 97.0 percent (see table). The same low predictive ability of all three models is observed when the existence of earnings management is determined by the presence of a small earnings increase and restatements (untabulated).

The second result shown in the table is that the analyst-based accruals model does not perform better than the modified Jones or Dechow-Dichev models and, in fact, performs even worse. This suggests that the measure of unexpected accruals derived from the difference between analysts' earnings forecasts and their own cash flow forecasts does not effectively detect earnings management. One of the reasons for the poor performance of this model could be that, in contrast to the modified Jones model, the analyst-based model fails to relate accruals to the *actual* level of sales. As a result, it misidentifies accruals stemming from an unexpected level of activity as discretionary. The analyst-based estimation of unexpected accruals could be improved by correcting it for unexpected sales. Another explanation for the model's poor performance is that analysts' forecasts may already incorporate earnings management expectations, rendering the unexpected accruals generated by the model devoid of expected earnings management.[22]

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[22] Past research provides conflicting evidence on whether analysts incorporate anticipated earnings management in their forecasts. Givoly et al. (2007), Liu (2005), and Burgstahler and Eames (2003) suggest that analysts do incorporate the earnings management component in their earnings forecasts. In contrast, Abarbanell and Lehavy (2003a, 2003b) conclude that analysts either do not anticipate earnings management or they choose to exclude the managed earnings component from their forecasts. Ettredge et al. (1995) find that analysts only partially discount overstated earnings in revising their earnings expectations.

Our conclusions based on the above analysis of "detection ability" are subject to an important caveat. In our methodology, earnings management is detected through the presence of sufficiently large unexpected accruals. Yet, earnings management could be achieved with smaller accruals, particularly if earnings are managed to beat a threshold. Second, our method of identifying likely earnings management cases as those with a small profit, a small earnings increase, or a downward restatement which, while common in the accounting literature, may lead us to identify "innocuous" cases as earnings management. Again, this is particularly true when the identification of earnings management is based on small profits or small earnings increases. Indeed, the notion that earnings management is likely to exist when earnings are "just above" an earnings threshold (e.g., Hayn 1995; Burgstahler and Dichev 1997) has recently been debated in the literature.[23]

VII. IMPLICATIONS FOR THE "DEMAND HYPOTHESIS"

The demand explanation for the time-series and cross-sectional variability in the availability of analysts' cash flow forecasts is supported by the results of some previous studies and is, indeed, quite appealing. Likewise, the related assertion that analysts' cash flow forecasts are sophisticated appears plausible.[24] However, our findings that cash flow forecasts are of low accuracy and easily replicated by investors by adding back the depreciation and amortization expenses to the already available analysts' earnings forecasts raise questions about the validity of the demand hypothesis.

Other indications, beyond low accuracy and lack of sophistication of cash flow forecasts, exist in the data that suggest that investor demand may not be a major factor behind the increase in the availability of these forecasts over time. First, the cross-sectional analysis shows a strong industry concentration in the availability of cash flow forecasts, with firms in the energy industry being the most likely to have cash flow forecasts and firms in industries such as healthcare, finance, and capital goods having the lowest frequency of such forecasts. These concentration patterns have not changed over time (see Panel B of Table 2). Second, for this finding to be consistent with the demand hypothesis, the earnings quality in the industries with a higher availability of cash flow forecasts should be lower than the earnings quality in the industries with the lowest concentration of cash flow forecasts. Our tests (untabulated) using the Dechow and Dichev (2002) approach for gauging accrual (or earnings) quality, show no such difference. A third finding that calls into question the demand explanation for the cross-sectional variability in the availability of cash flow forecasts is the steady upward trend in the frequency of cash flow forecasts over time. This trend continues beyond the sample period. By 2005, cash flow forecasts exist for almost 57.2 percent of the firms with earnings forecasts. If one excludes certain industries, such as financial institutions, for which cash flows are not a particularly meaningful measure of performance, cash flow forecasts are provided fairly universally. The current widespread availability of cash flow forecasts diminishes the plausibility of the demand explanation for the (very limited) cross-sectional variation in availability of cash flow forecasts, although one might still argue that the trend itself is demand-driven, prompted by a gradual impairment in the quality of earnings forecasts over time.

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[23] See Beaver et al. (2007), Dechow et al. (2003), Durtschi and Easton (2005), and Jacob and Jorgensen (2007).

[24] DeFond and Huang (2003, 81) note that, "I/B/E/S documents indicate that the cash flow forecasts submitted by contributing analysts are relatively sophisticated measures of cash flows from operations, and not simply mechanical manipulations of earnings such as EBITDA (a measure that basically involves adding interest, taxes, depreciation, and amortization to net income)." Interestingly, this sophistication "assertion" is relied upon as a "finding" by subsequent research (see, for example, McInnis and Collins 2008; Pae et al. 2007).

Note, however, that the findings of previous studies on the temporal change in the information content of earnings are not conclusive. To shed light on the question of whether earnings over time have fallen out of favor relative to cash flows as a performance measure among investors, we conducted a count of articles in the financial press citing "earnings" and its derivatives (e.g., "earnings-per-share") and those citing "cash flow" and its derivatives. Using the Factiva database for this examination, we find that the ratio of the number of articles that cite cash flow as a percentage of articles citing earnings is fairly constant, at about 11 percent, over the years 1991–2005. While this is indirect, anecdotal evidence, it is nonetheless inconsistent with the notion that cash flows have become more prominent and more demanded over time.

Finally, I/B/E/S representatives whom we contacted attribute the increased availability of cash flow forecasts, at least in part, to that organization's greater collection efforts made in an attempt to provide a broader spectrum of expectation data.

Although revisiting the demand hypothesis is beyond the scope of this study, the evidence presented here suggests the need for a further articulation of this hypothesis and for a reconciliation of the results of this study with the findings of previous research that appear to be supportive of this hypothesis.

VIII. CONCLUDING REMARKS

This study examines the quality of cash flow forecasts, an emerging new product of the analysts' industry that is currently produced for about 60 percent of the firms receiving earnings forecasts. We find that these forecasts are of a considerably lower quality than earnings forecasts. Specifically, cash flow forecasts are much less accurate and are less frequently revised than are earnings forecasts. Further, they appear to involve little more than a naïve extension of the accompanying earnings forecasts, leading us to conclude that the difference between the forecasted earnings and cash flows is not a good estimate of the accrual amount expected by investors.

There are indications that the low quality of these forecasts is due in part to the presence of data-quality issues. In many instances, it appears that the forecasted cash flow variable is defined differently than the actual cash flow variable. Related to this difference is our finding of a high frequency of cases with a discrepancy between the actual cash flow amount reported by I/B/E/S and that reported by Compustat. These discrepancies likely contribute to the documented higher prediction errors of analysts' cash flow forecasts as well as to their poor performance as a proxy for expected accruals. Even though this is an issue of data quality rather than inherent forecast quality, the two are inseparable. Neither investors nor researchers are capable of adjusting the reported cash flows so as to make them consistent with, and therefore a meaningful reference point to, any given cash flow forecast.

One possible explanation for the lower accuracy of cash flow forecasts relative to earnings forecasts is that earnings expectations are more likely than cash flow expectations to be managed by the reporting firms (through management guidance) so as to meet analysts' forecasts, resulting in lower forecast errors for earnings. This explanation applies primarily to forecasts made late in the year. Our results, however, show that the relatively lower accuracy of cash flow forecasts prevails among the initial forecasts made early in the year.

Two comments on the accuracy results are in order. First, while accuracy is not the only dimension of usefulness (e.g., the forecasts also can assist in interpreting other financial information), it is difficult to envision situations in which the presence and content of inaccurate forecasts would help investors. Second, the fact that cash flow forecasts are not universal may raise the issue of self-selection, whereby analysts' cash flow forecasts are demanded (and hence supplied) when the prediction of cash flows is difficult, which may explain the observed high forecast errors for the available cash flow forecasts. Note, however, that cash flow forecasts are now available for the majority of firms, making the self-selection explanation less compelling. Further, our findings show that the accuracy of analysts' cash flow forecasts relative to earnings has not improved over time, even though cash flow forecasts have become more widespread.

The finding of the lower accuracy of cash flow forecasts, the minor improvement in that accuracy during the year, the fact that these forecasts represent in essence a trivial extension of analysts' earnings forecasts, and the evidence on the presence of serious data-quality issues are all relevant for investors who might consider using these forecasts in valuation and investment decisions. They are also relevant in research settings in which analysts' cash flow forecasts are used to proxy for investors' expectations or their presence serves as an indicator variable (e.g., for earnings quality). These findings suggest that further research on the factors affecting the variation in accuracy of cash flow forecasts across analysts would be useful, similar to the study of the cross-sectional variation in earnings forecasts. Exploring analysts' characteristics such as their experience and the number of firms and industries they follow (e.g., Clement 1999; Clement and Tse 2005) might uncover some of the sources of the lower accuracy and shed more light on the demand hypothesis.

The findings also show that analysts' cash flow forecasts have incremental power in explaining contemporaneous annual stock returns (beyond earnings forecasts or a time-series cash flow model). However, this incremental power is marginal, suggesting that in certain research settings researchers may use time-series models instead of analysts' cash flow forecasts without adversely affecting the power of the tests.

Even though analysts' cash flow forecasts are found to be inaccurate, future research could still benefit from using them in various research settings, particularly if the focus is on subsamples of forecasts that exhibit a higher level of accuracy. This study identifies four such subsamples: those comprised of forecasts produced for firms with a greater analyst following and those for more profitable firms, larger firms, and high-growth firms. Finally, the finding that cash flow forecasts are of low quality and in essence a straightforward extension of the earnings forecasts does not necessarily invalidate the notion that cash flow forecasts serve as an indicator of earnings quality and are an outcome of investor demand. However, to substantiate these notions, we need a better understanding of the reasons for the demand for these relatively low-quality forecasts and of the source of the signaling value associated with their presence.

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Improving Investors' Forecast Accuracy when Operating Cash Flows and Accruals Are Differentially Persistent

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ABSTRACT: This study uses an experiment to examine (1) what factors give rise to investors' inability to fully incorporate operating cash flows and accruals into their earnings forecasts, and (2) what conditions help to improve investors' forecast accuracy when operating cash flows and accruals exhibit differential persistence. I investigate how decomposing the forecasting task and altering the presentation format combine to enable analysts and nonprofessional investors to acquire and accurately process financial statement information when operating cash flows and accruals are differentially persistent. I find that the earnings forecasts of analysts and M.B.A. students are more accurate only when participants are required to provide separate forecasts for operating cash flows and accruals and the income statement is altered to present the disaggregated cash and accrual components of earnings.

Keywords: *analysts; nonprofessional investors; earnings components; differential persistence; forecast accuracy.*

Data Availability: *Contact the author.*

I. INTRODUCTION

Expectations of future earnings are a fundamental driver of firm value; accordingly, accurate earnings forecasts are important for efficient price formation in capital markets (Penman 2001; Stickney et al. 2003; White et al. 2003). Earnings are composed of operating cash flows and accruals, which prior research finds are differentially persistent. While research shows that this differential persistence is value relevant to investors, it also

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demonstrates that stock prices act as if investors do not fully incorporate the differential persistence of these earnings components into their forecasts (Sloan 1996; Barth et al. 2001).

Given the value relevance of operating cash flows and accruals, the presentation format of these earnings components in the financial statements has received a great deal of attention (Stuart 2008). In fact, the standard-setting boards' Financial Statement Presentation Project has recently proposed major changes to the presentation format of the cash and accrual components of income statement items in the financial statements (FASB 2007; Reason 2005). Given these proposals, it is useful to consider (1) what factors give rise to investors' inability to fully incorporate operating cash flows and accruals into their earnings forecasts, and (2) what conditions help to improve investors' forecast accuracy when earnings exhibit differentially persistent components. I conduct an experiment to examine these two issues.

I propose that investors' inability to fully incorporate the differential persistence of operating cash flows and accruals in their earnings forecasts results from their failure to fully *acquire* and *process* this financial statement information (Hogarth 1980; Maines and McDaniel 2000).[1] When operating cash flows and accruals are equally persistent, investors need only acquire and process net income on the income statement to accurately forecast earnings. However, when the earnings components exhibit differential persistence, the aggregated net income line item obfuscates the persistence of its components (Barth et al. 2001; Hirshleifer and Teoh 2003). In this case, investors must acquire and accurately process information concerning both operating cash flows and accruals to accurately forecast earnings. Failing to accurately complete either the acquisition or processing operations will lead to inaccurate forecasts.

I consider two manipulations to address investors' difficulties with acquiring and accurately processing information concerning operating cash flows and accruals. While all participants were required to forecast net income, I manipulate the structure of the forecasting task to determine the effect of information acquisition on investors' forecast accuracy. Specifically, experimental participants forecast earnings in response to being asked to either (1) forecast net income, or (2) separately forecast operating cash flows and accruals (that were subsequently combined to represent a forecast of net income). Consistent with the objectives of the Financial Statement Presentation Project, I also manipulate presentation format to vary the ease with which investors can accurately process financial statement information. Participants received either financial statements (income statement, balance sheet, statement of cash flows) in a traditional format or in a format with the income statement altered to present the disaggregated cash and accrual components of earnings.

This study documents that both analysts and M.B.A. students provide less accurate earnings forecasts when operating cash flows and accruals are differentially persistent relative to when these components are equally persistent. I find that requiring participants to forecast both operating cash flows and accruals and altering the presentation format of the financial statements improves their forecast accuracy. However, neither manipulation is sufficient in isolation to improve investors' forecast accuracy. Instead, this study suggests that the efficacy of the standard-setters' proposals concerning the presentation format of operating cash flows and accruals is influenced by what information investors acquire *and* how they process this information.

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[1] "Acquisition" refers to *what* financial statement information investors use to forecast earnings. This definition combines two aspects of acquisition, i.e., investors' attention to financial statement information and investors' selection of information to use when forecasting earnings. "Processing" refers to *how* investors use the acquired financial statement information to forecast earnings.

This study contributes to the literature on how investors forecast earnings. I confirm prior archival research by documenting a deficiency in investor behavior, advancing this line of research that examines investors' ability to incorporate the time series properties of earnings into their forecasts (e.g., Maines and Hand 1996; Bradshaw et al. 2001). For example, Bradshaw et al. (2001) find that analysts' forecasts do not reflect the differential persistence of operating cash flows and accruals. Further, Maines and Hand (1996) provide experimental evidence documenting that investors do not correctly incorporate the time series properties of quarterly earnings when forecasting earnings. Building off this prior research, this study shows that investors' forecasts of earnings are less accurate when the components of earnings are differentially persistent and that this inaccuracy is due to investors' acquisition and processing of financial statement information.

These findings have implications for the Financial Statement Presentation Project. While prior research demonstrates that presentation format affects investors' judgments (e.g., Hirst and Hopkins 1998; Maines and McDaniel 2000), this study suggests that changing the presentation format of the financial statements is not always sufficient to improve investors' forecast accuracy. Specifically, this study indicates that the benefits arising from altering the presentation format of the financial statements are limited by investors' information acquisition biases. These findings suggest that investors stand to benefit from an education agenda informing them how acquiring disaggregated financial statement information can improve forecast accuracy.

Section II provides a summary of the relevant literature and develops hypotheses. Section III explains the experimental method. Sections IV and V discuss the results and conclude the paper, respectively.

II. BACKGROUND AND HYPOTHESES

Persistence of Operating Cash Flows and Accruals

Prior research addresses the existence, cause, and effects of the differential persistence of operating cash flows and accruals. With respect to the *existence* of differential persistence, various studies use pooled samples of firm-years to document that operating cash flows and accruals are differentially persistent into future earnings (Sloan 1996; Collins and Hribar 2000; Barth et al. 2001; Xie 2001; Elgers et al. 2003).[2] Recent research re-examines the existence of differential persistence by using firm-specific estimations. For example, Francis and Smith (2005) examine firm-specific differential persistence, finding that approximately 13 percent of firms exhibit significantly different levels of persistence for operating cash flows and accruals. While this percentage appears low, the firm-specific time series regressions performed are estimated using only between 20 and 40 annual observations. Using an alternative measurement for differential persistence, Call et al. (2007) estimate that at least 40 percent of all firm-year observations exhibit differential persistence.

Sloan (1996) attributes the *cause* of differential persistence to the greater use of managerial discretion in measuring and reporting accruals relative to operating cash flows. This assertion is supported by Xie (2001), who finds that discretionary accruals are significantly less persistent than operating cash flows and nondiscretionary accruals. Other research suggests that differential persistence stems from the differential effect of growth on operating cash flows and accruals, and not earnings management (Fairfield et al. 2003a, 2003b; Dechow et al. 2008).

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[2] Consistent with Sloan (1996), I define "persistence" as the implications of the current earnings components for future earnings.

Regardless of the cause of differential persistence, the results of prior research suggest that U.S. investors face an economy consisting of both firms with differentially persistent operating cash flows and accruals and firms with equally persistent operating cash flows and accruals. The existence of both types of firms creates uncertainty for investors when forecasting earnings and raises the question of how differential persistence affects investors' judgments. Various archival studies examine the *effect* of differential persistence on investors' judgments as reflected in stock prices (e.g., Sloan 1996; Xie 2001; Desai et al. 2004; Richardson et al. 2005). This research finds that stock prices act as if investors fail to fully incorporate the differential persistence into their earnings forecasts. However, archival methods are limited in their ability to examine the underlying processes that lead to this observed deficiency (Bradshaw 2008). In contrast, experimental methods enable researchers to examine *how* investors forecast earnings and to locate deficiencies in investors' information processing.

Using experimental methods, this study examines how investors' acquisition and processing of financial statement information affects their forecast accuracy when operating cash flows and accruals are differentially persistent. The study's first hypothesis is consistent with the suggestion of prior archival studies that the differential persistence of operating cash flows and accruals affects the accuracy of investors' earnings forecasts. This hypothesis represents a necessary condition for the study's second hypothesis, which examines the efficacy of two manipulations that seek to aid investors' acquisition and processing of financial statement information.

Forecasting Earnings with Differentially Persistent Components

Hirshleifer and Teoh (2003) demonstrate analytically that aggregating earnings components with differential persistence can obfuscate the persistence of the underlying components. To illustrate this point, consider two time series: an increasing growth time series (e.g., 1, 3, 6, 10, 15, ?) and a reversing time series (e.g., 1, 3, 1, 3, 1, ?). These two time series can also be aggregated to form an aggregated time series (i.e., 2, 6, 7, 13, 16, ?).

While it is relatively straightforward to solve both of the individual time series in isolation, it is more difficult to solve the aggregated time series from the aggregated information alone. This difficulty arises because aggregation of the two different time series obfuscates the underlying components' time series. Therefore, in a situation where both of these components and the aggregated time series are presented, successfully solving the aggregated time series is likely to depend upon what information is acquired. In contrast, if the underlying time series components exhibit the same time series properties, it is equally difficult to solve the time series regardless of what information is acquired.

This illustration is analogous to the implications of the differential persistence of operating cash flows and accruals for investors' forecast accuracy.[3] When these earnings components exhibit differential persistence, what information investors acquire affects their forecast accuracy. Prior research suggests that investors fixate on earnings and often fail to consider other relevant information when forecasting earnings (e.g., Abdel-khalik and Keller

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[3] As suggested by Hirshleifer and Teoh (2003), this setting may be generalized to other settings where multiple components of earnings with different implications for future earnings are aggregated (e.g., earnings of various segments with different growth rates).

1979; Hand 1990). Sloan (1996, 291) proposes that "investors 'fixate' on earnings and fail to distinguish between the accrual and cash flow components of current earnings."[4]

When operating cash flows and accruals are differentially persistent, if investors only acquire information from the income statement, it is likely that their forecasts will be relatively inaccurate compared with the forecasts derived from acquiring information concerning both operating cash flows and accruals. The same implications for investors' forecast accuracy do not arise when they acquire only aggregated information if the components are equally persistent.

> **H1:** Investors' earnings forecasts will be relatively less accurate when operating cash flows and accruals are differentially persistent than when these earnings components are equally persistent.

Improving Investors' Forecast Accuracy

Hogarth (1980) provides a conceptual model of judgment based upon individuals' acquisition and processing of information. This model proposes that individuals must acquire and accurately process information in order to make accurate judgments. The same framework has been applied to forecasting (Hogarth and Makridakis 1981) and to various accounting contexts (e.g., Maines and McDaniel 2000; Hodge et al. 2004). This study considers the efficacy of two manipulations aimed at improving investors' acquisition and processing of information concerning operating cash flows and accruals when these components are differentially persistent.[5]

Hogarth (1980) proposes that the operations of judgment are acquisition of information, processing of information acquired, and an output. These operations are influenced by the schema that each person brings to the task. A person's schema reflects his/her beliefs, knowledge, and experience concerning the task. In this study, I do not directly examine the effect of schema on the forecasting task but instead concentrate on the operations of judgment (i.e., acquisition, processing, and output).

Figure 1 applies Hogarth's (1980) model to the forecasting task when earnings exhibit differentially persistent operating cash flows and accruals. This figure presents two problems concerning acquisition and processing of information that investors face in this setting. As suggested by prior research, investors tend to limit their information *acquisition* to earnings (i.e., earnings fixation) and fail to acquire information about the differential persistence of operating cash flows and accruals ("Problem 1" in Figure 1). "Acquisition" refers to what financial statement information investors use to forecast earnings.[6]

Prior research (e.g., Hodder et al. 2008) also suggests that investors face difficulties accurately *processing* information concerning operating cash flows and accruals on the statement of cash flows ("Problem 2" in Figure 1). "Processing" refers to how investors use the acquired financial statement information to forecast earnings. For example,

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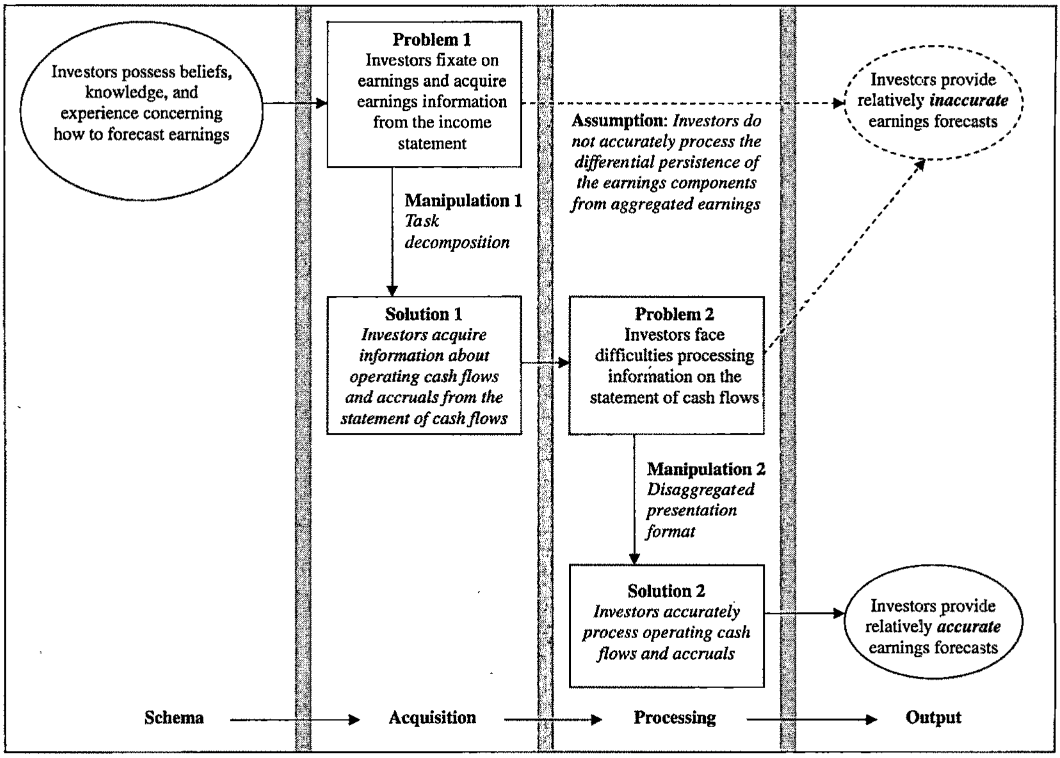
[4] Dechow et al. (2008) attempt to provide further archival evidence on the "earnings fixation" explanation for investors' difficulty forecasting earnings when operating cash flows and accruals are differentially persistent. This study utilizes experimental methods to further investigate this issue.

[5] This section of the study only considers the setting where earnings exhibit differentially persistent components. When operating cash flows and accruals are equally persistent, investors' forecast accuracy is likely to remain unaffected if investors fixate on earnings, i.e., in this setting, the earnings time series is no more difficult to process than the time series of its components.

[6] In this study, I am interested in whether investors use information concerning operating cash flows and accruals to forecast earnings (e.g., from the statement of cash flows) or whether they appear to limit their information acquisition to aggregated earnings information (i.e., earnings fixation).

FIGURE 1
Investors' Forecasting of Earnings when Operating Cash Flows and Accruals are Differentially Persistent


Investors possess beliefs, knowledge, and experience concerning how to forecast earnings
Problem 1
Investors fixate on earnings and acquire earnings information from the income statement
Manipulation 1
Task decomposition
Solution 1
Investors acquire information about operating cash flows and accruals from the statement of cash flows
Assumption: Investors do not accurately process the differential persistence of the earnings components from aggregated earnings
Problem 2
Investors face difficulties processing information on the statement of cash flows
Manipulation 2
Disaggregated presentation format
Solution 2
Investors accurately process operating cash flows and accruals
Investors provide relatively inaccurate earnings forecasts
Investors provide relatively accurate earnings forecasts
Schema
Acquisition
Processing
Output

investors might acquire information concerning operating cash flows and accruals from the indirect method presentation of operating cash flows on the statement of cash flows, but may not be able to process the information presented in this format. In this study, I consider the effects of two manipulations aimed at improving investors' acquisition and processing of information when operating cash flows and accruals are differentially persistent.

Decomposing the Forecasting Task to Improve Investors' Information Acquisition

Hogarth (1980) suggests that the physical structure of a task can affect information acquisition. When people face complex tasks, prior research suggests that task decomposition requires them to acquire information concerning all the relevant components of the tasks (Kleinmuntz 1988; Kleinmuntz et al. 1996; Morera and Budescu 2001; Wilks and Zimbelman 2004). This research is based on the "divide and conquer" principle. This principle suggests that "(1) complex decision problems should be decomposed into smaller, more manageable parts, and (2) these smaller parts should be logically aggregated to derive an overall value for each alternative" (Morera and Budescu 1998, 187).

In this study, task decomposition requires investors to separately forecast the earnings components instead of earnings (i.e., "Manipulation 1" in Figure 1). Investors who only acquire aggregated earnings information process information for which aggregation obscures the differential persistence of operating cash flows and accruals. The decomposed task requires investors to acquire information concerning operating cash flows and accruals, enabling them to then process these earnings components. Task decomposition directly addresses "Problem 1" in Figure 1, i.e., it requires investors to acquire information concerning operating cash flows and accruals.

Altering the Presentation Format to Improve Investors' Information Processing

Hogarth (1980) suggests that investors will not accurately forecast earnings when they cannot accurately process information concerning operating cash flows and accruals despite acquiring this information, i.e., "Problem 2" in Figure 1. Almost all U.S. firms use the indirect method to present operating cash flows. This method presents operating cash flows by adding back accruals to earnings. Hodder et al. (2008) find that it is difficult for investors to process information presented using the indirect method.[7]

I vary the presentation format of the financial statements to improve investors' processing of operating cash flows and accruals when these components are differentially persistent (i.e., "Manipulation 2" in Figure 1).[8] This manipulation reflects some of the changes proposed by the Financial Statement Presentation Project. The Financial Accounting Standards Board recently proposed dramatic changes to the financial statements through altering the "display and disaggregation [of information] to give a richer picture of what's really going on" (Reason 2005, 54). The chairman of the FASB stated his belief that changes to the presentation format will "allow users to see that the income statement and cash flow statement are two different ways of looking at performance—one on an accrual basis and one on a cash basis—and use them together" (Reason 2005, 54).

To demonstrate the effect of the Financial Statement Presentation Project's possible reforms in a context in which operating cash flows and accruals are differentially persistent, I incorporate three suggestions made by Maines and McDaniel (2000). These suggestions are (1) disaggregating earnings into its components, (2) linking the components, and (3) placing these components on the income statement. These suggestions motivate the "Disaggregated Presentation Format" that I use in this study to manipulate the presentation format of the financial statements.

Investors using the "Traditional Presentation Format" of the financial statements need to process the indirect method of the statement of cash flows to identify and estimate the annual inputs to the time series of operating cash flows and accruals. In contrast, investors using the "Disaggregated Presentation Format" do not need to identify and estimate the annual inputs to the time series of operating cash flows and accruals because these inputs are presented as separate line items at the bottom of the income statement for these investors. I expect that investors presented with the "Disaggregated Presentation Format" will be able to more accurately process information concerning operating cash flows and accruals in the financial statements.

The Interaction of Information Acquisition and Information Processing

Both information acquisition and information processing potentially present difficulties to investors when earnings exhibit differentially persistent operating cash flows and accruals. I argue that decomposing the forecasting task will assist investors only if they can accurately process the information that they acquire. Equally, altering the presentation format of the financial statements will improve investors' forecast accuracy only if they acquire this information. This reasoning leads to the predicted interaction effect of task decomposition and presentation format on investors' forecast accuracy when operating cash flows and accruals are differentially persistent.

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[7] Some difficulties that the indirect method may pose to investors include the need for investors to understand what the line items represent that are used to reconcile earnings and operating cash flows, the need to identify operating cash flows on the statement of cash flows, and the need to compute accruals.

[8] The "Disaggregated Presentation Format" manipulation may also improve investors' acquisition of information concerning operating cash flows and accruals. However, I argue that if investors are fixated on earnings, then simply making other financial information more salient may not alter investors' acquisition of information.

> **H2:** When operating cash flows and accruals are differentially persistent, decomposing the task and presenting the disaggregated earnings components on the income statement interact to increase the accuracy of investors' earnings forecasts.

III. EXPERIMENTAL METHOD

Participants

Figure 1 suggests that individuals possess different schema that, in turn, can affect the judgment process. With respect to forecasting tasks, accounting research using archival methods has provided mixed evidence on whether analysts possess different schema compared with nonprofessional investors. While some studies imply that professional investors are superior forecasters of accounting information (e.g., Bartov et al. 2000; Collins et al. 2003), Bradshaw et al. (2001) and Elgers et al. (2003) find no evidence that analysts' forecasts reflect the relatively lower persistence of accruals. Given these mixed findings, I recruited both financial analysts and M.B.A. students to participate in this study to ensure that the findings are robust to the study's participants potentially possessing different schema.

Seventy-four financial analysts were recruited from four large investment advisory firms, two investment banks, and the treasury department of a large commercial bank to participate in the experiment. These analysts had an average of eight years of professional experience working as financial analysts and they covered 16 different industries. On average, 47 percent of their professional responsibilities involved analyzing equity securities and 53 percent of the analysts were chartered financial analysts. Almost three-quarters of the analysts worked on the sell-side. One hundred twenty-eight first-year M.B.A. students from a large state university served as surrogates for nonprofessional investors.[9]

Experiment Design and Task

I used a $2 \times 2 \times 2 \times 2$ mixed model design. Within subjects, I manipulated whether participants provide forecasts for a firm with differentially persistent or equally persistent operating cash flows and accruals (*FIRM*). Both "Task Decomposition" (*TD*) and "Presentation Format" (*PF*) are manipulated between subjects. In addition, I used two investor groups: analysts and M.B.A. students (*INVESTOR*).

All participants were issued financial statements (income statement, balance sheet, statement of cash flows) containing five years of historical annual information and were asked to provide forecasts for the following year for both a firm with differentially persistent operating cash flows and accruals (i.e., Firm DIFF) and a firm with equally persistent operating cash flows and accruals (i.e., Firm SAME).

I manipulated *TD* by informing participants in the *TD* conditions that "Net Income" (i.e., earnings) consists of cash and non-cash Components, requiring these participants to separately forecast next year's "Cash Flows from Operating Activities" and "Non-Cash

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[9] Previous research also uses M.B.A. students as proxies for nonprofessional investors (e.g., Elliott 2006; Hodge et al. 2004).

Component of Net Income."[10] Participants in the *No TD* conditions were required to forecast next year's "Net Income."

I manipulated *PF* across two levels. Participants in the *Traditional PF* conditions viewed a set of financial statements that included the income statement in its traditional presentation format. Participants in the *Disaggregated PF* conditions viewed a set of financial statements that disaggregated net income into operating cash flows and accruals on the income statement below the net income line item. This presentation format of the income statement reconciles net income to operating cash flows by adding back accruals. All participants received the same presentation format for the balance sheet and the statement of cash flows.[11]

Financial Statements

I embedded the persistence of operating cash flows and accruals in the two experimental firms' financial statements. Firm DIFF (Firm SAME) is characterized by differentially (equally) persistent operating cash flows and accruals.[12] I also embedded stochastic percentage errors into the data so that earnings were not perfectly predictable from inspection of both firms' financial statements.[13] Firm DIFF's financial statements reflect three key characteristics of U.S. firms. These characteristics are the relative persistence, sign, and size of operating cash flows and accruals as described by many archival studies (e.g., Sloan 1996; Barth et al. 2001; Xie 2001; Call et al. 2007).[14]

Embedding predictable time series in the financial statements provides several advantages with respect to the study's internal validity. First, embedding predictable time series enables participants to accurately forecast earnings based upon the time series of financial statement information alone. Second, this design allows investigation of whether investors accurately incorporate the persistence of operating cash flows and accruals into their forecasts. Finally, the time series embedded in net income is also observable in net operating revenues, cost of goods sold, and gross profit. Therefore, if participants use this information to forecast earnings, then their forecasts would presumably be no more accurate than if they only used the information in the aggregated net income time series. This design allows me to infer that relatively less accurate earnings forecasts are indicative of participants not separately acquiring information concerning operating cash flows and accruals and/or not being able to accurately process information in the financial statements concerning these components.

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[10] I use the label "Non-Cash Component of Net Income" in the materials as it is arguably more descriptive than the potentially ambiguous "Accruals" label.

[11] Importantly, there is no differential information content across the *PF* conditions. The financial statements given to the participants are constructed so that accruals represent the difference between earnings and operating cash flows. Maintaining these relationships in the financial statements ensures that participants in the *Traditional PF* conditions can calculate accruals and are not disadvantaged through the content of the financial statements that they received. Therefore, I manipulate the presentation format rather than the amount of information given to participants.

[12] I embedded an increasing growth time series for operating cash flows $\left(\text{i.e., } CASH_t = 1{,}022 + 100 \cdot \left[\sum_{k=0}^{t-1} k\right]\right)$ and a reversing time series for accruals ($ACC_t = -274 + 150(-1)^t$) for Firm DIFF. Extrapolating these time series to the next year (i.e., $t = 6$) produces perfect forecasts of operating cash flows, accruals, and earnings for Firm DIFF of 2,522, -124, and 2,398, respectively. I embedded linear growth time series (i.e., $CASH_t = 269 + 350(t)$; $ACC_t = -7 - 50(t)$) for Firm SAME's earnings components. Extrapolating these time series to the next year (i.e., $t = 6$) produces perfect forecasts of operating cash flows, accruals, and earnings for Firm SAME of 2,369, –307, and 2,062, respectively.

[13] Embedding stochastic percentage errors avoids demand effects that may result in participants relying more on operating cash flows and accruals than (1) other items in the experimental materials that are not perfectly predictable, or (2) they would in reality when these earnings components are not perfectly predictable. Consistent with Ackert et al. (1997), stochastic percentage errors were determined for these earnings components by sampling from a distribution in which +5 percent, 0 percent, and –5 percent occurred with probabilities of 0.2, 0.6, and 0.2, respectively.

[14] On average, prior research shows that earnings are less (more) persistent than operating cash flows (accruals). Also, prior research suggests that accruals tend to be negative and relatively small, while operating cash flows tend to be positive and relatively large. Firm DIFF possesses these three characteristics.

Procedure

Participants began the experiment by accessing the study's web address that was sent to each of them via email. After accessing the website, all participants viewed the same introduction to the study and general instructions. When ready to commence the experiment, participants clicked on a "Continue" button that presented them with the first forecasting task. All participants were required to perform two forecasting tasks, i.e., forecast earnings of Firm DIFF and Firm SAME. I randomized across participants whether they first completed the forecasting task for Firm DIFF or Firm SAME, before completing the other firm's forecasting task.

Each forecasting task involved the receipt of a firm's financial statements followed by the request for participants to provide their forecasts. The first screen informed participants that they would be required to forecast next-year "Net Income" (*No TD* conditions) or both "Cash Flows From Operating Activities" and "Non-Cash Component of Net Income" (*TD* conditions). Then participants started the specific forecasting task by clicking on one of the three hyperlinked labels representing each of the financial statements. Participants then viewed a screen presenting that particular financial statement in the bottom frame of the screen and the forecasting task in the top frame of the screen (e.g., "Forecast the Net Income for Firm DIFF in 2006"). Participants could view any of the three financial statements for the firm at any time and in any order by clicking on the hyperlinked financial statement label for that firm in the bottom frame of the screen. When ready to submit their forecasts, participants entered their forecasts in the top frame of the screen and pressed the "Submit Forecast" button. Participants repeated this process for the second firm.

In addition to completing the forecasting tasks, participants were required to complete several post-experimental questions. Participants were asked to solve different time series (i.e., the same time series embedded in the financial statements) in order to assess their ability to solve these time series. These questions were included to test the assumptions concerning participants' ability to solve the time series embedded in the materials and to ensure that the average ability of participants did not significantly differ across conditions. Participants were asked to provide the next number in a linear growth time series (e.g., 4, 8, 12, 16, 20, ?), an increasing growth time series (e.g., 1, 3, 6, 10, 15, ?), a reversing time series (e.g., 1, 3, 1, 3, 1, ?), and an aggregated increasing growth and reversing time series (e.g., 2, 6, 7, 13, 16, ?). Finally, participants were asked to answer a range of demographic questions. On average, participants completed the two forecasting tasks and answered the time series questions in 19 minutes.

Dependent Measure

Participants forecasted earnings in response to being asked to either (1) forecast net income, or (2) separately forecast operating cash flows and accruals (that were subsequently combined to represent a forecast of net income). This study uses percentage forecast accuracy as the dependent variable, defined as follows:

$$\text{Accuracy (\%)} = 1 - [|\text{Forecasted Net Income} - \text{Actual Net Income}|/\text{Actual Net Income}].$$

I use the time series embedded in the materials to determine actual earnings for the forecast year (i.e., Firm DIFF: 2,398; Firm SAME: 2,062).

IV. RESULTS

Hypothesis Tests

The 202 participants provided 404 forecasts of net income. Five Firm DIFF forecasts (all provided by M.B.A. students) and 11 Firm SAME forecasts (two provided by analysts and nine provided by M.B.A. students) were excluded because they exceed the overall mean forecast accuracy by over four standard deviations.[15] Table 1 presents the descriptive statistics for participants' forecast accuracy.

To test H1, I perform a mixed model ANOVA (see Table 2, Panel A). Hypothesis 1 predicts that investors' earnings forecasts will be relatively less accurate when operating cash flows and accruals are differentially persistent than when these components are equally persistent. The mean forecast accuracy for Firm DIFF is 74.06 percent, while the mean forecast accuracy for Firm SAME is 89.88 percent (Table 1). Consistent with H1, Panel A of Table 2 reports a significant main effect for *FIRM* ($F = 74.11$, $p < 0.01$, two-tailed).

Hypothesis 2 predicts an interaction effect between task decomposition and presentation format on investors' Firm DIFF forecast accuracy, such that investors' earnings forecasts will be more accurate only when the task is decomposed and the disaggregated earnings components are presented on the income statement. Participants in the *TD/Disaggregated PF* condition have a mean Firm DIFF forecast accuracy of 80.29 percent as compared to participants in the *No TD/Traditional PF*, *TD/Traditional PF*, and *No TD/Disaggregated PF* conditions, which have means of 70.76 percent, 72.71 percent, and 72.02 percent, respectively (Figure 2).

Table 2, Panel B provides weak evidence supporting H2 ($F = 2.91$; $p = 0.09$, two-tailed).[16] One possible reason for the strength of this evidence is the potential "loss in power for the interaction effect" (Bobko 1986, 324). Prior research recommends the use of planned contrast analysis to test an ordinal interaction to increase the power of the statistical test (Bobko 1986; Buckless and Ravenscroft 1990; Rosnow and Rosenthal 1995).

Consistent with H2, I use the following contrast weights for each condition: *No TD/Traditional PF* = −1; *TD/Traditional PF* = −1; *No TD/Disaggregated PF* = −1; and,

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[15] As suggested by Conover and Iman (1981), I include these outliers and use a repeated measures ANOVA on ranks test to assess the robustness of my tests. I use this rank transformation due to the nonparametric nature of the data when including outliers. Including outliers, the repeated measures ANOVA on ranks test for H1 provides inferentially identical results ($p < 0.01$, two-tailed, untabulated) to the mixed model ANOVA (Table 2, Panel A). Further, including outliers and using ranks to test H2 provides inferentially identical results ($p < 0.01$, two-tailed, untabulated).

[16] Caution should be taken in interpreting the findings reported in Table 2, Panel B. Panel B of Table 2 reports significant main effects for *TD* ($F = 5.25$, $p = 0.02$, two-tailed) and *PF* ($F = 5.26$, $p = 0.02$, two-tailed), which suggests that each of the manipulations improved participants' forecast accuracy, in isolation. However, the mean Firm DIFF forecast accuracy of each of the *TD/Traditional PF* and *No TD/Disaggregated PF* conditions does not significantly differ from the *No TD/Traditional PF* condition (both two-way comparisons $p > 0.40$, two-tailed, untabulated). Only the mean Firm DIFF forecast accuracy of the *TD/Disaggregated PF* condition is significantly greater than the mean forecast accuracy of each of the other three conditions (all two-way comparisons $p < 0.03$, two-tailed, untabulated). Therefore, these two-way comparisons suggest that the main effects for the *TD* and *PF* manipulations do not hold across both levels of the other independent variable.

TABLE 1
Descriptive Statistics: Forecast Accuracy

	Analysts				M.B.A. Students				Overall	
	Firm DIFF		Firm SAME		Firm DIFF		Firm SAME		Firm DIFF	Firm SAME
	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)
No TD/Traditional PF	20	71.00 (8.71)	19	92.52 (6.41)	29	70.59 (8.54)	29	92.17 (4.43)	70.76 (8.52)	92.31 (5.24)
TD/Traditional PF	16	69.50 (11.22)	16	91.62 (6.92)	33	74.27 (19.02)	30	89.77 (11.36)	72.71 (16.90)	90.22 (9.97)
No TD/Disaggregated PF	18	71.83 (9.05)	17	89.65 (12.70)	29	72.14 (11.21)	27	87.78 (14.10)	72.02 (10.34)	88.50 (13.45)
TD/Disaggregated PF	20	77.75 (17.34)	20	87.85 (9.76)	32	81.88 (14.44)	33	88.94 (9.79)	80.29 (15.58)	88.53 (9.70)
Overall	74	72.70 (12.38)	72	90.22 (9.25)	123	74.88 (14.58)	119	89.67 (10.42)	74.06 (13.80)	89.88 (9.98)
Mean Δ Due to *TD*		+2.69		−1.89		+6.65		−0.72	+5.24	−1.18
Mean Δ Due to *PF*		+4.61		−3.18		+4.70		−2.53	+4.63	−2.77

Experimental participants forecast earnings in response to being asked to either (1) forecast net income, or (2) separately forecast operating cash flows and accruals (that were subsequently combined to represent a forecast of net income). Accuracy (percent) is calculated as 1 − [|Forecasted Net Income − Actual Net Income|/Actual Net Income].

TABLE 2
Hypothesis Testing

Panel A: Mixed Model Analysis of Variance

Source of Variance	**Hypothesis**	**df**	**F-statistic**	**p-value**
Main Effects				
Firm (*FIRM*)	1	1	74.11	0.00
Investor type (*INVESTOR*)		1	1.03	0.31
Task decomposition (*TD*)		1	2.61	0.11
Presentation format (*PF*)		1	0.11	0.74
Two-Way Interaction Effects				
FIRM × *INVESTOR*		1	2.23	0.14
FIRM × *TD*		1	5.98	0.02
FIRM × *PF*		1	7.64	0.01
INVESTOR × *TD*		1	2.25	0.14
INVESTOR × *PF*		1	0.14	0.71
TD × *PF*		1	2.12	0.15
Three-Way Interaction Effects				
FIRM × *INVESTOR* × *TD*		1	1.03	0.31
FIRM × *INVESTOR* × *PF*		1	0.10	0.75
FIRM × *TD* × *PF*		1	0.47	0.49
INVESTOR × *TD* × *PF*		1	0.00	0.98
Four-Way Interaction Effect				
FIRM × *INVESTOR* × *TD* × *PF*		1	0.88	0.35

Panel B: Analysis of Variance—Firm DIFF

Source of Variance	**Hypothesis**	**df**	**F-statistic**	**p-value**
Main Effects				
Investor type (*INVESTOR*)		1	1.23	0.31
Task decomposition (*TD*)		1	5.25	0.02
Presentation format (*PF*)		1	5.26	0.02
Two-Way Interaction Effects				
INVESTOR × *TD*		1	1.41	0.24
INVESTOR × *PF*		1	0.00	0.99
TD × *PF*	2	1	2.91	0.09
Three-Way Interaction Effect				
INVESTOR × *TD* × *PF*		1	0.04	0.85

Panel C: Hypothesized Contrast—H2[a]

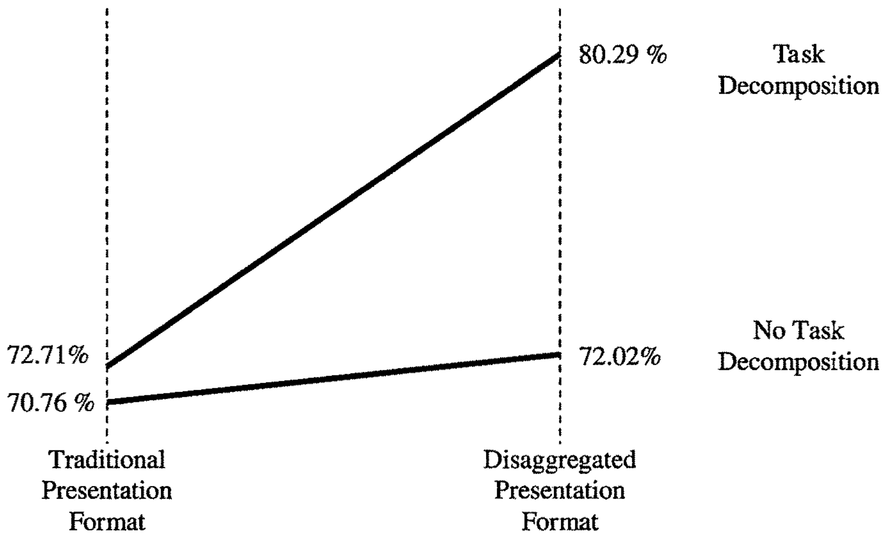
	df	**t-statistic**	**p-value**
Analysts	70	2.19	0.03
M.B.A. Students	119	3.32	0.00
Combined	193	3.94	0.00

All reported p-values are two-tailed.

[a] To test the predicted interaction for H2, I use the following contrast weights for each condition:
No Task Decomposition/Traditional Presentation Format = −1;
Task Decomposition/Traditional Presentation Format = −1;
No Task Decomposition/Disaggregated Presentation Format = −1; and,
Task Decomposition/Disaggregated Presentation Format = +3.

FIGURE 2
Hypothesis 2: Observed Forecast Accuracy[a]
(Firm DIFF)

Dependent Variable: Forecast Accuracy



This figure depicts the observed pattern of participants' mean forecast accuracy when the earnings components are differentially persistent (Firm DIFF).

[a] Accuracy (%) is calculated as 1 − [|Forecasted Net Income − Actual Net Income|/Actual Net Income].

TD/Disaggregated PF = +3. As required, these contrast weights sum to zero.[17] Table 2, Panel C provides evidence supporting H2 (t_{193} = 3.94; $p < 0.01$, two-tailed). The hypothesized interaction holds for both groups of participants (analysts: t_{70} = 2.19; p = 0.03, two-tailed; M.B.A. students: t_{119} = 3.32; $p < 0.01$, two-tailed).

Additional Analyses

To lend further support to the theoretical model underlying the study's hypotheses as presented in Figure 1, I provide four additional analyses. First, I consider participants' acquisition of financial statement information and the efficacy of the *TD* manipulation (i.e., "Manipulation 1" in Figure 1). Second, I consider how the *PF* manipulation improves participants' processing of operating cash flows and accruals (i.e., "Manipulation 2" in Figure 1). Third, I use participants' responses to the time series questions to confirm the assumption that investors have difficulty solving an aggregated time series characterized by two underlying components with differential persistence (i.e., "Assumption" in Figure 1). Finally, I present several robustness checks.

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[17] These findings are robust to all alternative sets of contrast weights (e.g., −2, −1, −1, +4; −4, −3, −2, +9; −4, −2, −1, +7) that reflect the predicted pattern, i.e., the synergistic effect of combining both manipulations (all $p < 0.01$, two-tailed, untabulated).

Manipulation 1: Acquisition of Financial Statement Information

I assume in Figure 1 that investors predominately acquire income statement information as opposed to information from the other financial statements when forecasting earnings. Data collected concerning participants' acquisition of information while completing the experiment supports this assumption. First, over 80 percent of all participants chose to access the income statement first when asked to forecast earnings. Further, participants in the *No TD* conditions spent, on average, over two-thirds of their time viewing the income statement. Finally, over 80 percent of participants in the *No TD* conditions were viewing the income statement when they submitted their forecasts.

The assumption that investors predominately acquire income statement information to forecast earnings is valid for both analysts and M.B.A. students. On average, analysts in the *No TD* conditions (74 percent) spent a *greater* percentage of their time viewing the income statement relative to M.B.A. students in the *No TD* conditions (64 percent) ($F = 3.31$, $p = 0.07$, two-tailed, untabulated). This finding is contrary to the suggestion that sophisticated users of financial statements (e.g., analysts) are more inclined to acquire additional information not presented on the income statement relative to less sophisticated users of financial statements. As one analyst succinctly stated in an email after completing the experiment, "[A]nalytically, we are all creatures of habit when assessing relationships and quantitatively estimating prospective financial performance." This study suggests that *both* analysts and nonprofessional investors are subject to heuristics that lead them to limit their attention to the earnings line item.

The *TD* manipulation was introduced to increase participants' acquisition of information concerning operating cash flows and accruals from the statement of cash flows (i.e., "Solution 1" in Figure 1). Consistent with this objective, participants in the *TD* conditions spent a smaller percentage of their time viewing the income statement (45 percent for participants in the *TD* conditions versus 69 percent for participants in the *No TD* conditions, $F = 34.17$, $p < 0.01$, two-tailed, untabulated) and a greater percentage of their time viewing the statement of cash flows (40 percent for participants in the *TD* conditions versus 13 percent for participants in the *No TD* conditions, $F = 65.33$, $p < 0.01$, two-tailed, untabulated).

Manipulation 2: Processing of Operating Cash Flows and Accruals

The objective of the *PF* manipulation is to analyze how investors process information concerning operating cash flows and accruals. When these earnings components are differentially persistent, participants' forecasts of both components are significantly more accurate when the presentation format displays the disaggregated earnings components on the income statement as opposed to the traditional presentation format of the financial statements (operating cash flows: $F = 11.66$, $p < 0.01$, two-tailed, untabulated; accruals: $F = 16.57$, $p < 0.01$, two-tailed, untabulated). This finding suggests that participants in the *Disaggregated PF* conditions found it easier to process operating cash flows and accruals relative to participants in the *Traditional PF* conditions.

Data collected concerning participants' acquisition of information while completing the experiment supports this conclusion. To simultaneously process the earnings components before submitting their forecasts, participants in the *TD/Disaggregated PF* condition had the choice of processing either the disaggregated information on the income statement or the statement of cash flows. Participants in the *TD/Disaggregated PF* condition were more (less) likely than participants in the *TD/Traditional PF* to view the income statement (statement of cash flows) immediately before they submitted their forecasts (income statement: 70 percent for participants in the *TD/Disaggregated PF* condition versus 29 percent for participants in the *TD/Traditional PF* condition; statement of cash flows: 17 percent for participants in the *TD/Disaggregated PF* condition versus 65 percent for participants in the *TD/Traditional PF* condition). This data corroborates the prediction that the *PF* manipulation would improve investors' forecast accuracy when investors acquire information concerning operating cash flows and accruals (i.e., "Solution 2" in Figure 1).

Participants' Ability to Solve Time Series

After completing the forecasting tasks, participants were asked to solve various time series. These time series were the same series that were embedded in operating cash flows and accruals in the materials (i.e., linear growth, increasing growth, reversing). The design of the experiment is based on the assumption that participants find it more difficult to solve an aggregated time series when two different time series are aggregated relative to when two similar time series are aggregated. The time series questions were asked to ensure that this assumption holds for the experimental participants.

In isolation, participants found the three time series similarly difficult to solve. Over 90 percent of all participants solved each of these time series correctly and most participants required less than 20 seconds to solve each of these time series. However, participants found it more difficult to solve the aggregated time series (i.e., aggregated increasing growth and reversing time series). Most participants took more than 100 seconds to provide a solution to this time series and only 42 percent of analysts and 37 percent of M.B.A. students solved this time series correctly. Participants' ability to solve these time series does not differ significantly between conditions nor is it significantly associated with participants' forecast accuracy (both $p > 0.25$, untabulated).

Robustness Checks

To rule out alternative explanations for my findings, I test whether various demographic/performance variables are correlated with forecast accuracy. I find that the time taken to complete the two forecasting tasks and the time series questions and the order in which participants were required to forecast the firms are not significantly correlated with forecast accuracy (both $p > 0.50$, untabulated). With respect to the analyst participants, I find that experience, percentage of time at work directly devoted to equity security analysis, CFA membership, industry specialization, and buy-side versus sell-side affiliation are not correlated with forecast accuracy (all $p > 0.30$, untabulated). With respect to the M.B.A. students, I find that the number of accounting and finance classes previously taken, full-time work experience, the nature of full-time work experience, experience analyzing financial statements, and experience trading stock or debt securities are not correlated with forecast accuracy (all $p > 0.20$, untabulated).

V. CONCLUSIONS

This study considers how investors' acquisition and processing of financial statement information affects their forecast accuracy when operating cash flows and accruals are differentially persistent. I find that the forecasts of both analysts and M.B.A. students are less accurate when operating cash flows and accruals are differentially persistent relative to when these components are equally persistent. In addition, manipulations that alter investors' acquisition of information and the ease with which this information can be accurately processed improve investors' forecasting accuracy when operating cash flows and accruals are differentially persistent.

These findings suggest that the standard-setting boards' consideration of how best to present information concerning operating cash flows and accruals in the financial statements is both warranted and potentially beneficial. This study suggests reforms that aid the acquisition and accurate processing of operating cash flows and accruals can improve investors' forecast accuracy when these components are differentially persistent.

However, while changing the presentation format represents a necessary condition, findings suggest that this change alone is insufficient to improve investors' forecast accuracy when the earnings components are differentially persistent. This study highlights the need for standard-setters to consider what information investors acquire and the presentation format of this information. By also considering investors' acquisition of information, this study lends empirical support to suggestions made by prior research that investors fixate on earnings, leading to inaccurate forecasts when components are differentially persistent (Sloan 1996; Barth et al. 2001; Hirshleifer and Teoh 2003).

Both analysts and M.B.A. students appear to face difficulties forecasting earnings when operating cash flows and accruals are differentially persistent. I find no significant difference between the mean forecast accuracy of analysts and M.B.A. students when operating cash flows and accruals are differentially persistent. This result is consistent with the findings of Bradshaw et al. (2001) and Elgers et al. (2003) that analysts do not appear to discern the differential persistence of operating cash flows and accruals.

These findings suggest further that investors could potentially benefit from an education agenda informing them of (1) the need to acquire information concerning operating cash flows and accruals when forecasting earnings, and (2) how to process information concerning operating cash flows and accruals presented on the statement of cash flows. These forms of knowledge may allow investors to develop a schema that aids them in more accurately forecasting earnings.

With respect to investors' forecasting schema, this study raises the question as to why investors do not appear to learn to acquire a richer information set than that presented on the income statement. The fact that many firms do not have differentially persistent earnings components (Francis and Smith 2005) suggests that, in many cases, investors can accurately discern the persistence of earnings from the aggregated earnings time series. The existence of these firms could reinforce the earnings fixation tendencies of investors who accurately forecast earnings in cases where firms' earnings exhibit equally persistent earnings components. One way to extend this study would be to empirically consider other elements of Hogarth's (1980) judgment model to see how reinforcement, feedback, and learning occur in a forecasting environment where investors provide forecasts for firms with differentially persistent earnings components and firms with equally persistent earnings components.

Finally, analysts can possess different schema than nonprofessional investors. For example, analysts could be more inclined than novices to acquire information other than the information presented in the financial statements to discern the differential persistence of operating cash flows and accruals (e.g., industry affiliation, firm age). That is, the limited information presented in this experiment may not alert investors to the differential persistence of the earnings components because they may typically acquire other information to discern differential persistence. Future research could consider how experience affects investors' forecasting schema. For example, it may be worthwhile to consider if familiarity with particular firms/industries and nonfinancial information alerts investors to the differential persistence of operating cash flows and accruals.

This study is subject to several limitations. First, this study does not consider how incentives affect forecast accuracy. Analysts and nonprofessional investors normally face meaningful incentives, not all of which are replicable in an experimental setting. Second, I limit the amount of information and resources provided to participants so that they could complete the experiment in a reasonable amount of time. Analysts and nonprofessional investors have considerably more information and resources available to them when they make their forecasts than what they were provided with in this experiment. Finally, both firms used in the experiment are hypothetical. Despite these limitations, this study provides evidence concerning what factors give rise to investors' inability to fully incorporate operating cash flows and accruals into their earnings forecasts and what conditions help to improve investors' earnings forecast accuracy when earnings exhibit differentially persistent components.

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Auditor Conservatism and Investment Efficiency

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ABSTRACT: We develop a theoretical framework to investigate (1) both the determinants and the consequences of auditor conservatism in a capital market setting and (2) the implications of Section 201 of the Sarbanes-Oxley Act for auditor conservatism and investment efficiency. We derive three primary results. First, by adjusting the mix of audit and nonaudit fees, companies with high business risk induce auditor conservatism, while companies with low business risk induce auditor aggressiveness. Second, if auditor conservatism is in force, a greater client pressure on auditors improves audit quality; but if auditor aggressiveness is in force, a greater client pressure on auditors impairs audit quality. Third, the nature of a firm's investment inefficiency (overinvestment or underinvestment) depends on its auditor's attestation (conservative or aggressive). Our analysis also implies that a mandatory restriction of nonaudit services imposed by Section 201 may decrease audit quality and damage investment efficiency.

Keywords: *auditor conservatism; audit quality; investment efficiency; nonaudit services.*

I. INTRODUCTION

Empirical research provides evidence that, since the demise of Arthur Andersen and the enactment of the Sarbanes-Oxley Act (SOX) in 2002, auditors have become more conservative in auditing their client firms (Cahan and Zhang 2006; Lobo and Zhou 2006). This finding is perhaps not surprising in light of the heightened litigation risk faced by auditors and the restrictions they now encounter in performing audit and nonaudit services for their clients. Nonetheless, the literature offers little by way of systematic analysis of the *determinants and consequences* of auditor conservatism. Therefore, we develop a

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theoretical framework to investigate (1) both the causes and the effects of auditor conservatism and (2) the implications of the increased auditor conservatism in a post-SOX world.

It is a well-accepted notion that auditing reduces the information risk in accounting reports, thereby improving investors' investment decision (Arens et al. 2006). Thus, we focus on the link between auditing and investment efficiency. Specifically, we model the interactions between corporate decisions and investors' decisions and assess how auditing mediates these interactions. We focus on two aspects of auditing: audit quality and auditor conservatism. *Audit quality* is the probability that an auditor will detect misstatements in financial statements.[1] The audit process may produce either conclusive evidence or inconclusive evidence. Inconclusive evidence (i.e., auditor doubt) raises the issue of the nature of the auditor's attestation. We refer to the attestation of an auditor who, when in doubt, disapproves a favorable client report as *auditor conservatism* and to the attestation of an auditor who, when in doubt, approves a favorable client report as *auditor aggressiveness*.[2]

We address both the demand for and the supply of auditing. That is, we investigate how auditor conservatism and audit quality arise *endogenously* in equilibrium. Specifically, we examine how auditor conservatism and audit quality affect the information content of the audited accounting report. Investors in the capital market extract information from the audited accounting report, price the firm, and make their investment decisions accordingly. The capital market's pricing rule induces the firm demand for auditing that, in turn, affects the firm's auditor fee decision. In turn, auditor fees, balanced against the auditor's litigation risk, determine the auditor supply of auditing. Overall, the demand for and the supply of auditing determine the equilibrium auditor conservatism and audit quality. Our model generates four main results.

1. Companies with high business risk induce auditor conservatism, while companies with low business risk induce auditor aggressiveness. This finding contributes to the literature by linking auditor conservatism to client characteristics and therefore identifying the determinants of auditor conservatism in a capital market setting. We also provide a theoretical explanation for the positive relation between firm business risk and conservatism that has been documented empirically (see, e.g., Khan and Watts 2007).
2. If auditor conservatism is in force, then a greater client pressure on auditors improves audit quality; but if auditor aggressiveness is in force, then a greater client pressure on auditors impairs audit quality. Client pressure on auditors can take the form of potential client businesses for the auditor, such as nonaudit services and repeat audit engagements (Kornish and Levine 2004). This result is contrary to the popular belief that client pressure on auditors is always bad. We find that client pressure is desirable when the auditor is conservative.
3. The nature of investment efficiency depends on the auditor's attestation. Given auditor conservatism, an unfavorable report triggers overinvestment. Given auditor aggressiveness, a favorable report triggers underinvestment. In specifying the conditions under which investment inefficiencies arise, we contribute to the literature by identifying the real effects of auditing.

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[1] Our definition of audit quality is similar to that used in the theoretical auditing literature (see, for example, Dye 1993; Hillegeist 1999).

[2] Our definition of auditor conservatism is consistent with that used in the auditing profession. When in doubt, a conservative auditor requires her client to make a downward adjustment to the financial statements or else she will issue a qualified or adverse opinion. If the auditor knows her client's financial condition without doubt, a request for a downward adjustment is viewed as a "correction," not as "conservatism."

4. Our results shed light on the potential effects of Section 201 of the Sarbanes-Oxley Act of 2002, which prohibits public companies from granting their auditors many types of nonaudit services. Section 201 aims at constraining client pressure on auditors. However, our model implies that such a one-size-fits-all constraint may lead to unintended consequences. We find that a mandatory restriction of client pressure in general and nonaudit services in particular (1) increases auditor conservatism, (2) decreases a conservative auditor's audit quality and increases an aggressive auditor's audit quality, (3) increases overinvestment and decreases underinvestment, and (4) increases the audit fee. The above predictions can be used by both public policy makers in evaluating Section 201 and by empirical researchers in making pre-SOX versus post-SOX comparisons.

The extant literature on theories of conservatism is characterized by three strands of research: GAAP conservatism research (e.g., Gigler and Hemmer 2001), which focuses on the effects of the conservatism embedded in generally accepted accounting principles (GAAP); managerial conservatism research (e.g., Levine 1996), which focuses on the choice of the degree of conservatism in managerial reporting decision within GAAP; and auditor conservatism research. The last strand is sparse and is the perspective we adopt in this paper.

In contrast to Antle and Nalebuff (1991), who study auditor conservatism in the client-auditor negotiation process, or Patterson and Smith (2003), who examine it in the presence of materiality uncertainty, we analyze the effects of auditor conservatism on investment decisions in a capital market setting.

Whereas Shibano (2000) studies the effect of auditor conservatism on investment without exploring audit quality and Schwartz (1997) identifies the effect of audit quality on investment without introducing auditor conservatism, we show that auditor conservatism and audit quality are jointly determined and are therefore inherently linked. Thus, we investigate the relation between those two aspects of auditing and investment.

Kornish and Levine (2004) demonstrate in a contractual setting that a contingent audit fee contract can induce an unbiased audited accounting report. We show that, in a market setting, auditor biases (either conservatism or aggressiveness) will emerge in equilibrium. While Kornish and Levine (2004) concentrate exclusively on the auditor's reporting decision, we study both auditor biases and audit quality decisions. In Kornish and Levine (2004), restricting nonaudit services leads to uninformative reports; in our study, the effect of restricting nonaudit services is case-specific: it impairs investment efficiency in the case of a conservative auditor but improves investment efficiency in the case of an aggressive auditor.

Our paper is related to Li (2001), who studies commitment to conservatism in a group decision-making setting in which group members must make a decision on whether to accept or reject a job candidate. He shows that group members have the incentive to free-ride on other members' evidence-gathering effort. His main finding is that commitment to a conservative hiring standard alleviates the free-rider problem in the sense that it stimulates the provision of effort. In both Li's (2001) model and ours, the anticipation of next-stage conservatism/aggressiveness affects the decision maker's current-stage evidence-gathering effort. In contrast to Li's (2001) result that conservatism is always socially beneficial in a free-riding context, we find that conservatism is desirable in terms of investment efficiency if and only if a firm has a high business risk.

Section II describes the model. Section III derives the supply of and the demand for auditing and shows how the two sides are linked by the capital market price and investment.

It then derives the client firm's optimal fees decision and characterizes the equilibrium auditor attestation and audit quality. Section IV discusses regulatory and empirical implications of the model. Section V concludes. The Appendix contains proofs of the major results.

II. MODEL

In this section, we specify the key ingredients of our model. A firm has a production technology that generates a stochastic return. If the firm's financial condition is good, denoted by G, then an investment of k generates a return of $2\mu\sqrt{k}$, where $\mu > 0$, and if the firm's financial condition is bad, denoted by B, then an investment of k generates a low return that we normalize to 0. With probability λ, the firm's financial condition will be G and with probability $1 - \lambda$, its financial condition will be B. We refer to the parameter $1 - \lambda$ as "client business risk."

We assume that, for life-cycle reasons, the current owners of the firm sell the firm to prospective owners at an endogenously determined market price of M. The new owners pay M to acquire the firm and then make an investment of k in the firm's technology. In order to value the firm and subsequently make an informed investment, the prospective investors require the firm to issue an audited accounting report.

The financial reporting process is as follows. At the beginning of the period, the firm hires an external auditor and chooses audit fees. The firm then proposes a report, y_G or y_B, to its auditor. Report y_G claims that the financial condition is G and report y_B claims that the financial condition is B. The firm strictly prefers the favorable report, y_G, to the unfavorable report, y_B. The firm's auditor accumulates audit evidence about the firm's financial condition and then attests to the client's proposed report.

The process of evidence accumulation (outlined in Figure 1) is as follows. The auditor chooses the quality of her audit procedures, $q \in [0,1]$. The audit cost, $c(q)$, is increasing and convex in q, with $c(0) = 0$, $c'(0) = 0$, and $c'(1) = \infty$. With probability q, the auditor obtains conclusive evidence, G or B; with probability $1 - q$, the auditor obtains inconclusive evidence, I.[3] We refer to the probability, q, of accumulating conclusive evidence as *audit quality*. The higher the audit quality, the more likely the auditor will detect any misstatement in the client report.

After accumulating evidence, the auditor makes an attestation decision about whether to approve the favorable client report, y_G. Given auditor approval, the client firm issues report y_G; given auditor disapproval, the client firm must issue report y_B. When the evidence is inconclusive, that is, when the auditor is in doubt, she must use her professional judgment to assess the firm's financial condition.[4] An auditor who, when in doubt, makes a decision to disapprove y_G is called conservative and one who, when in doubt, makes a decision to approve y_G is called aggressive. Thus, *auditor conservatism* or *aggressiveness* becomes an issue whenever the auditor is in doubt.[5]

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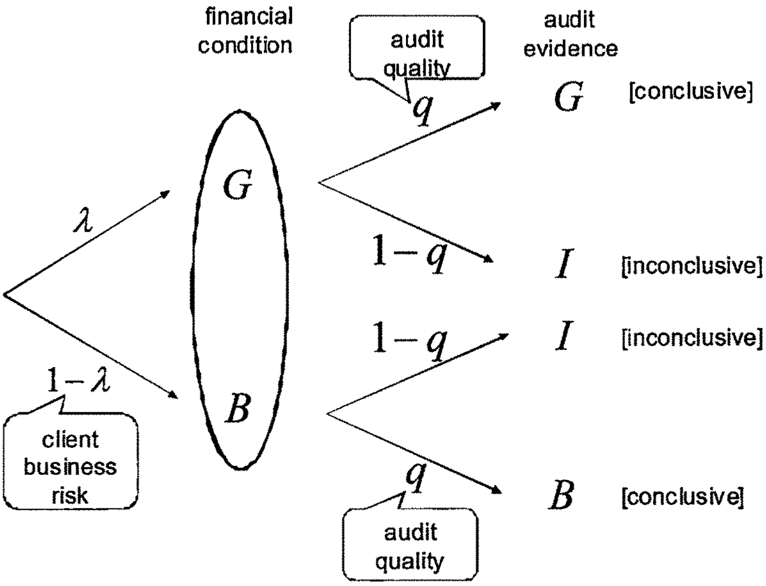
[3] In Figure 1, the firm's financial condition is circled, indicating that at the time of choosing her audit quality, the auditor does not know the client's financial condition; that is, the audit quality chosen is not dependent on the financial condition unknown to the auditor. In addition, because the client always proposes y_G, the audit quality chosen is not dependent on the reported financial condition either.

[4] The accumulated evidence may remain inconclusive because time and/or financial constraints force the auditor to stop digging for more evidence after a certain point in time.

[5] As the Securities and Exchange Commission accepts no financial statements accompanied by a disclaimer of audit opinion, we introduce no possibility of a disclaimer into our model, thereby essentially restricting the message space.

FIGURE 1
The Auditor's Evidence Accumulation



In making her attestation decision, the auditor is torn between the expected auditor fees from her client and the expected legal liability for overstatements in the client report.[6] The auditor receives an audit fee, F, which is not contingent on the auditor's attestation decision.[7] In addition, we denote the benefit to the auditor from the client's potential business opportunities by ϕ. The term ϕ could capture nonaudit fees and/or fees from repeat audit engagements. By granting or withholding those business opportunities, the client firm can effectively exert pressure on the auditor for a favorable audit opinion.[8] Therefore, ϕ can be effectively contingent on the audit opinion, representing client pressure on auditors (Kornish and Levine 2004).

In order to study the implications of SOX, we interpret ϕ in our environment as nonaudit fees. Before the enactment of SOX, client firms could hire their auditors for both audit and nonaudit services. However, under Section 201 of SOX, many types of nonaudit services are banned and still some other types are permitted (e.g., tax services); that is, SOX restricts (but does not eliminate) auditor-provided nonaudit services. We first introduce nonaudit services into our model and then investigate the economic consequences of restricting such services. In other words, we compare a pre-SOX regime in which nonaudit services are not restricted with a post-SOX regime in which they are restricted.

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[6] Like Dye (1993), our model does not include a client firm's legal liability to investors because we want to focus on the role of auditing. If such a liability were effective so that a firm with financial condition B would indeed report y_B, then auditing issues would become moot.

[7] The Code of Professional Conduct of the American Institute of Certified Public Accountants forbids contingent audit fees.

[8] We deliberately abstract away from the potential benefits of granting nonaudit services to the auditor such as synergies between audit and nonaudit services. Nonetheless, as we demonstrate in Section IV, even without these benefits, restricting client pressure may still be detrimental.

When the audited accounting report is issued, investors value the firm at price M and then invest k in the firm's production technology, which produces a return of $2\mu\sqrt{k}$ or 0 in a later point in time when the firm's financial condition, G or B, is revealed. If an overstatement is exposed—that is, if the return to investment is 0 but the audited accounting report was y_G—the auditor is legally liable to investors.[9] We denote the auditor's legal liability by L.[10]

The sequence of events is as follows:

- Nature selects the firm's financial condition, either G with probability of λ or B with probability of $1 - \lambda$. All agents know λ, but do not observe the financial condition at this time.
- The firm hires an auditor and chooses an audit fee, F, and a nonaudit fee, ϕ, both of which are disclosed publicly.
- The firm proposes the report y_G to the auditor.
- The auditor chooses the audit quality, q, of the audit procedures, and accumulates her audit evidence, G or B or I. Both the firm and its auditor observe the audit evidence.[11]
- The auditor makes her attestation, and the firm issues the audited accounting report, either y_G or y_B.
- The investors acquire the firm at price M and invest k in the firm's technology.
- The return to investment, $2\mu\sqrt{k}$ or 0, is realized (and therefore the financial condition, G or B, is revealed publicly).
- A legal liability, L (which is common knowledge), for any overstatement in the audited accounting report, is imposed on the auditor.[12]

Our model assumes that the firm and its auditor are symmetrically and imperfectly informed throughout the audit engagement.[13] However, investors in the capital market are less informed than the firm and its auditor in the sense that investors do not directly observe the audit evidence.

We impose the following additional assumptions: the firm chooses its auditor fees, F and ϕ, to maximize its expected capital market price less its expected auditor fees; the auditor chooses her audit quality, q, and her attestation (i.e., whether to approve y_G) to maximize her expected auditor fees less her expected legal liability and her audit cost;

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[9] We exclude auditor liability for understatement because it is seldom observed in practice. The reason for this phenomenon may be twofold. First, the client firm can penalize its auditor by withholding business opportunities, ϕ. Second, as Kornish and Levine (2004) observe, it is extremely difficult for capital market traders to make a case in a court of law for forgone investment opportunities resulting from understated financial statements. In contrast, it is relatively easy to make a case for the actual investment loss incurred because of overstatement.

[10] We can further assume that $L = sD$, where s is the probability that the auditor loses the lawsuit and D is the damage measure (see, e.g., Laux and Newman 2007). The parameter $s = 1$ corresponds to a strict liability rule and $s < 1$ corresponds to a due-care liability rule in the current legal regime. Given that the focus of our analysis is not on the optimal legal liability regime, we purposely do not decompose L.

[11] The observability of q is not an issue because we show later that, even if q were unobservable, it may be inferred from the variables ϕ and L.

[12] In principle, the auditor's legal liability, L, may either be equal to the investors' investment loss (an out-of-pocket damage measure), or smaller than the investment loss (a separate and proportionate liability), or larger than the investment loss (a punitive damage measure). We thank an anonymous reviewer for this taxonomy. The relative magnitude of L *vis-à-vis* the investors' investment loss is not important for our analysis. What is crucial is the fee-liability ratio, $\frac{\phi}{L}$. As shown later in the analysis, whatever the level of L may be, the firm will react by adjusting its choice of ϕ so as to achieve its desired fee-liability ratio.

[13] If the firm were to learn its financial condition after hiring the auditor so that it wishes to renegotiate the original audit contract, then all our results would still qualitatively hold. A proof of this claim is available upon request.

investors choose their investment, k, to maximize their expected return on investment. We assume both a competitive capital market and a competitive audit market.

III. EQUILIBRIUM

We conduct our analysis in the order illustrated in Figure 2. First, we investigate how the tension between auditor fees and auditor liability determines the supply of auditing. Next, using the fee/liability ratio, we show how the capital market interprets the audited accounting report in order to value the firm and make an investment decision. We then explore how the anticipation of the capital market's pricing rule generates the firm's demand for auditing. Finally, we characterize how the firm makes its auditor fee decision to implement its demand for auditing, which along with the auditor's supply of auditing, determines the equilibrium auditor conservatism and audit quality.

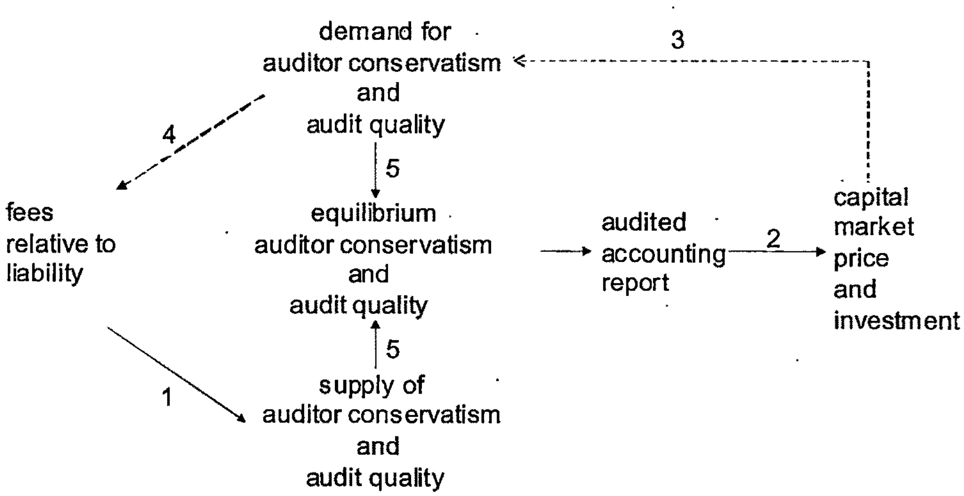
Supply of Auditing

We begin the analysis by deriving the supply of auditing (step 1 in Figure 2). On one hand, auditors face client pressure to approve favorable client reports; such client pressure is measured by the nonaudit fee, ϕ. On the other hand, if auditors succumb to such pressure, they risk legal liability, L. We next show that this tension, captured by the fee-liability ratio, $\frac{\phi}{L}$, determines the supply of both auditor conservatism and audit quality.

Supply of Auditor Conservatism

The client firm uses the nonaudit fee, ϕ, to pressure its auditor to approve its favorable report, y_G. It grants ϕ if its auditor approves y_G and withholds ϕ if its auditor disapproves

FIGURE 2
The Framework


demand for auditor conservatism and audit quality
3
4
5
fees relative to liability
equilibrium auditor conservatism and audit quality
audited accounting report
2
capital market price and investment
5
1
supply of auditor conservatism and audit quality

(The numbers indicate the order followed in the analysis.)

y_G.[14] On the other hand, a legal liability, L, will be imposed on the auditor when any overstatement in the audited accounting reports is eventually exposed. When making her attestation decision, the auditor trades off her expected fee against her expected liability. The auditor's expected payoff and attestation decision rule are as follows:

audit evidence	payoff from approving y_G	payoff from disapproving y_G	approving y_G if and only if
G [conclusive]	ϕ	0	$\frac{\phi}{L} \geq 0$
I [inconclusive]	$\phi - (1 - \lambda)L$	0	$\frac{\phi}{L} \geq 1 - \lambda$
B [conclusive]	$\phi - L$	0	$\frac{\phi}{L} \geq 1$

Disapproving y_G means forfeiting the nonaudit fee, ϕ, but the auditor risks no legal liability for overstatement. Thus, the auditor's expected payoff from disapproving y_G is 0. In contrast, approving y_G leads to a payoff of ϕ, but the auditor bears a litigation risk for overstatement. If the audit evidence is G, the auditor is safe; if the audit evidence is B, the auditor is definitely liable for L. If the audit evidence is inconclusive, the auditor assesses her client's business risk as $1 - \lambda$ (the probability of financial condition B). Thus, her expected liability is $(1 - \lambda)L$. The auditor's decision rule, stated in the last column of the table, is derived by comparing her expected payoffs from approving and disapproving y_G. Using this decision rule, we next derive the publicly issued accounting report, which depends on the tension between fee and liability, captured by $\frac{\phi}{L}$, and the audit evidence, G or B or I. Claim 1 and Figure 3 describe the audited accounting reports resulting from auditor-client interactions.

Claim 1:

(i) When $\frac{\phi}{L} \leq 1 - \lambda$, the audited accounting report issued is y_B unless the auditor's evidence is G, in which case report y_G is issued.

(ii) When $\frac{\phi}{L} \in [1 - \lambda, 1]$, the audited accounting report issued is y_G unless the auditor's evidence is B, in which case report y_B is issued.

(iii) When $\frac{\phi}{L} \geq 1$, the audited accounting report issued is always y_G.

We refer to the attestation of an auditor who, when in doubt, disapproves y_G as *auditor conservatism* and to the attestation of an auditor who, when in doubt, approves y_G as

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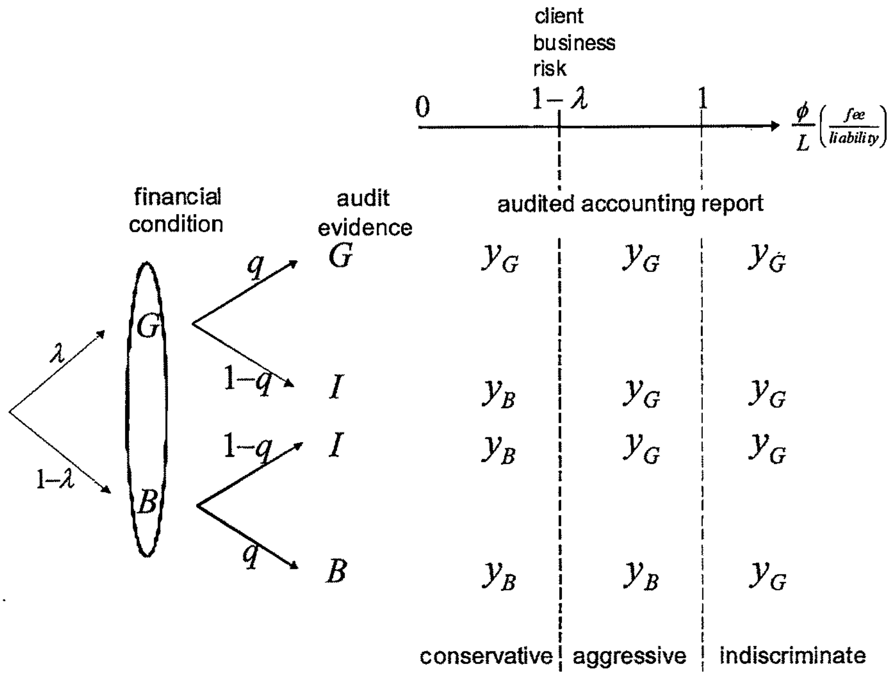
[14] If the client firm reneges—that is, if the firm withholds ϕ after the auditor approves its favorable report, y_G—the auditor can recall her audit opinion. Such a threat by the auditor precludes client reneging in our one-period model. However, in a multiperiod setting, such a threat may not work.

FIGURE 3
The Supply of Auditor Conservatism



auditor aggressiveness.[15] The following observations can be made about auditor conservatism and auditor aggressiveness.

Remark 1:

(i) The favorable report y_G produced by a conservative attestation perfectly reveals the firm's financial condition G, while a favorable report y_G produced by an aggressive attestation may overstate the firm's financial condition. Conversely, the unfavorable report y_B produced by an aggressive attestation perfectly reveals the firm's financial condition B, while the unfavorable report y_B produced by a conservative attestation may understate the firm's financial condition.

(ii) If the client's business risk is large $\left(\text{i.e., if } 1 - \lambda > \frac{1}{2}\right)$, a conservative attestation results in a lower likelihood of misstatements in the audited financial report relative to an aggressive attestation. Conversely, if the client's business risk is small $\left(\text{i.e., if } 1 - \lambda < \frac{1}{2}\right)$, an aggressive attestation results in a lower likelihood of misstatements in the audited financial report relative to a conservative attestation. A higher audit quality (i.e., a higher q) reduces the likelihood of misstatements.

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[15] As Figure 3 illustrates, when the fee overwhelms the liability $\left(\frac{\phi}{L} \geq 1\right)$, the auditor approves y_G regardless of her audit evidence, a strategy termed "indiscriminate attestation." Note that any report produced from an indiscriminate attestation is uninformative to outsiders. We show later that a client firm would not induce an indiscriminate attestation in equilibrium.

(iii) A fee-liability ratio below the client business risk $\left(\frac{\phi}{L} < 1 - \lambda\right)$ induces auditor conservatism, whereas a fee-liability ratio above the client business risk $\left(\frac{\phi}{L} > 1 - \lambda\right)$ induces auditor aggressiveness.

Remark 1 (i) demonstrates that the information content of the audited accounting report depends on the nature of the auditor's attestation, i.e., whether she is conservative or aggressive. Remark 1 (ii) implies that client business risk $(1 - \lambda)$ and audit quality (q) are important determinants of the informativeness of the financial reporting and auditing system. Remark 1 (iii) states that whether an auditor's attestation is conservative or aggressive is endogenous, depends on the fee-liability ratio, $\frac{\phi}{L}$. That is, auditor conservatism or aggressiveness results from the auditor optimally trading off the expected nonaudit benefits against expected litigation costs. We later show how these three implications influence the firm's demand for auditing.

Supply of Audit Quality

We now derive the auditor's choice of audit quality. For a given fee-liability ratio, $\frac{\phi}{L}$, when choosing her audit quality, the auditor anticipates her subsequent attestation strategy (conservative, aggressive, or indiscriminate). The auditor's expected payoff at the time of her audit quality choice is her expected payoff from her subsequent attestation strategy less $c(q)$, the cost of performing audit procedures with quality q. Next, we discuss the auditor's expected payoff from the audit quality decision.

The case of auditor conservatism $\left(\frac{\phi}{L} \leq 1 - \lambda\right)$. From Figure 3, when $\frac{\phi}{L} \leq 1 - \lambda$, the auditor approves y_G only when her audit evidence is G. If her evidence is G (the probability of which is λq), then she receives ϕ (see the table in the preceding subsection). Therefore, the auditor's expected payoff in anticipation of a conservative attestation is:

$$\underbrace{\lambda q}_{\substack{\text{probability of}\\ \text{evidence } G}} \quad \underbrace{\phi}_{\substack{\text{payoff from}\\ \text{approving } y_G\\ \text{given } G}} \quad - \quad \underbrace{c(q)}_{\substack{\text{audit}\\ \text{cost}}} \cdot \tag{1}$$

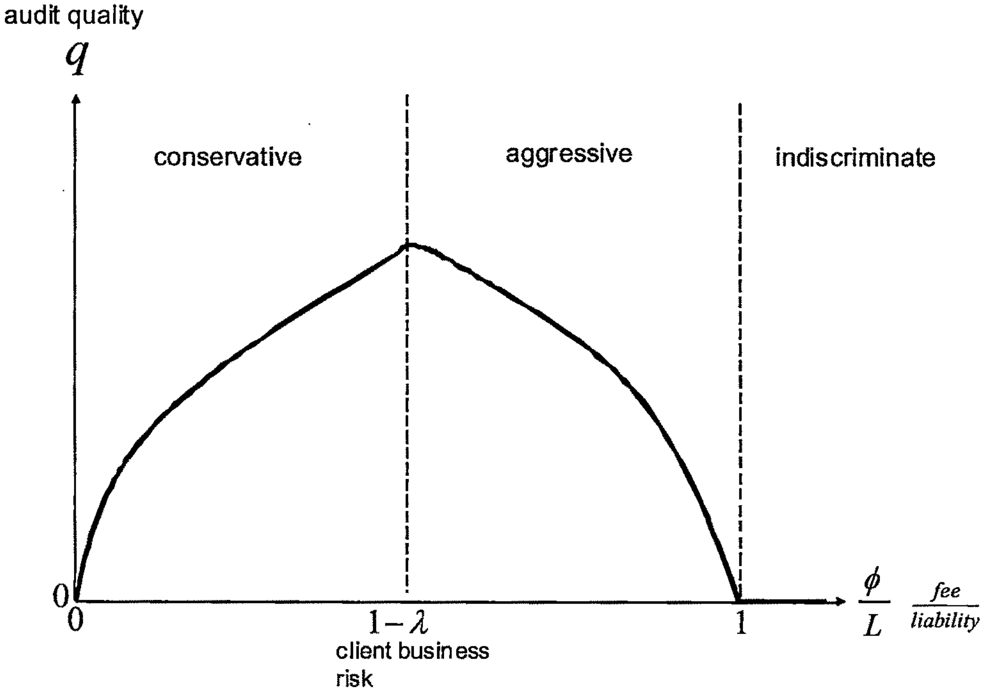
The case of auditor aggressiveness $\left(\frac{\phi}{L} \in [1 - \lambda, 1]\right)$. From Figure 3, when $\frac{\phi}{L} \in [1 - \lambda, 1]$, the auditor approves y_G when her audit evidence is either G or I. If her evidence is G (the probability of which is λq), then she will receive ϕ; if her evidence is I (the probability of which is $1 - q$), then she will receive $\phi - (1 - \lambda)L$ (see the table in the preceding subsection). Therefore, the auditor's expected payoff in anticipation of an aggressive attestation is:

$$\underbrace{\lambda q}_{\substack{\text{probability of}\\ \text{evidence } G}} \quad \underbrace{\phi}_{\substack{\text{payoff from}\\ \text{approving } y_G\\ \text{given } G}} + \underbrace{(1 - q)}_{\substack{\text{probability of}\\ \text{evidence } I}} \quad \underbrace{[\phi - (1 - \lambda)L]}_{\substack{\text{payoff from}\\ \text{approving } y_G\\ \text{given } I}} - \underbrace{c(q)}_{\substack{\text{audit}\\ \text{cost}}} \cdot \tag{2}$$

The case of an indiscriminate attestation $\left(\frac{\phi}{L} \geq 1\right)$. According to Figure 3, when $\frac{\phi}{L} \geq 1$, the auditor approves y_G regardless of her audit evidence. Thus, the auditor always receives ϕ. Because the probability of overstatement (approving y_G when the firm's financial condition is B) is $1 - \lambda$, the auditor's expected liability is $(1 - \lambda)L$. Therefore, the auditor's expected payoff is $\phi - (1 - \lambda)L - c(q)$.

The auditor's supply of audit quality is described in Proposition 2 and illustrated in Figure 4.

FIGURE 4
The Supply of Audit Quality



Claim 2: The auditor's supply of audit quality, q, is characterized as follows:

$$c'(q) = \lambda\phi \text{ for } \frac{\phi}{L} \leq 1 - \lambda \text{ (the case of auditor conservatism);} \tag{3}$$

$$c'(q) = (1 - \lambda)(L - \phi) \text{ for } \frac{\phi}{L} \in [1 - \lambda, 1] \text{ (the case of auditor aggressiveness);} \tag{4}$$

$$q = 0 \text{ for } \frac{\phi}{L} \geq 1 \text{ (the case of an indiscriminate attestation).}$$

It follows from Claim 2 that the supply of audit quality, q, is hump-shaped and non-differentiable at the hump point, as illustrated in Figure 4.

Remark 2: When the auditor is conservative, a higher fee-liability ratio increases the supply of audit quality $\left(\frac{dq}{d\left(\frac{\phi}{L}\right)} > 0\right)$, whereas when the auditor is aggressive, a higher fee-liability ratio decreases the supply of audit quality $\left(\frac{dq}{d\left(\frac{\phi}{L}\right)} < 0\right)$.

Remark 2 is contrary to the popular belief that client pressure on auditors, represented by ϕ in our environment, always damages audit quality. Our results imply that the effect of client pressure on audit quality depends on the nature of the auditor's attestation strategy. The popular belief applies only in the case of auditor aggressiveness. Conversely, when auditor conservatism is in force, client pressure actually improves audit quality.

The intuition for the above results is as follows. An auditor who expects to be conservative in her subsequent attestation (disapproving y_G when in doubt) may make a type I error and lose business opportunities offered by her client, represented by ϕ. The higher the fee at stake, the larger the expected loss from unknowingly understating the client's condition. Therefore, higher fees provide more incentive for the auditor to increase audit quality, q, to augment the chance of accumulating conclusive evidence. On the other hand, an auditor expecting to be aggressive in her subsequent attestation (approving y_G when in doubt) may make a type II error and bear excessive legal liability. Nonetheless, the larger the fees from her business opportunities offered by the client, the lower the expected loss from unknowingly overstating the client's condition. Therefore, when fees are higher, the auditor optimally reduces audit quality q.[16]

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[16] At the extreme, when she expects to be indiscriminate in her subsequent attestation (approving y_G regardless of audit evidence), the auditor has no incentive to accumulate audit evidence in the first place, so her supply of audit quality is minimal.

Figure 4 illustrates that a fee-liability ratio, $\frac{\phi}{L}$, simultaneously determines the auditor attestation (conservative or aggressive) and audit quality. Note that the existence of contingent fees is crucial in our one-period model. Without contingent fees, auditors would provide the minimal level of audit quality so that audited reports would be uninformative.[17]

Price and Investment

We now examine how investors in the capital market extract information from the audited accounting report to price the firm and to make their investment in the firm's production technology (refer to step 2 in Figure 2). We show that because both auditor conservatism and audit quality affect the information content of the firm's report (Remark 1 (i)), they affect the market price of the firm and the investors' investment in production technology.

Because investors do not know the firm's financial condition, G or B, they must infer it from all publicly available information. Let p denote the investors' perceived probability of financial condition G, i.e., $p \equiv \Pr(G \mid \textit{investors' information set})$ where p is derived below. Recall that an investment of k will generate a return of $2\mu\sqrt{k}$ if the financial condition is G and 0 if the financial condition is B. Therefore, investors choose k to maximize their net expected return, $p \cdot 2\,\mu\sqrt{k} - k$, which implies that the firm's optimal investment is given by:

$$k = p^2\mu^2. \tag{5}$$

The investors' perceived probability, p, of financial condition G, depends on the information content of the audited financial report, which in turn depends on the auditor attestation and audit quality. To derive p, investors use the fee-liability ratio, $\frac{\phi}{L}$, to infer the auditor conservatism and audit quality in order to interpret the audited accounting report. In our environment, investors know the fee-liability ratio because both ϕ and L are common knowledge. Figure 3 illustrates how the knowledge of the fee-liability ratio can be used to infer the auditor attestation (conservative (*C*), aggressive (*A*), or indiscriminate (*IND*)). Similarly, Figure 4 illustrates how knowledge of the fee-liability ratio can be used to infer the audit quality, q.

As Figure 3 illustrates, a favorable report resulting from auditor conservatism (i.e., y_G given *C*) perfectly reveals G; thus, $p = 1$. An unfavorable report resulting from auditor conservatism (i.e., y_B given *C*) may be issued either from a firm with financial condition G or from a firm with financial condition B. From Figure 3 and Bayes' rule, $p = \frac{\lambda(1-q)}{1-\lambda q}$. On the other hand, a favorable report resulting from auditor aggressiveness (i.e., y_G given *A*) may be issued from either a firm with financial condition G or a firm with financial condition B. Again using Figure 3 and Bayes' rule, $p = \frac{\lambda}{1-(1-\lambda)q}$. An unfavorable report resulting from auditor aggressiveness (i.e., y_B given *A*) perfectly reveals B; thus, p

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[17] In the conclusion we discuss how, in a multiperiod setting, other forces such as the auditor's reputation may provide incentives for the auditor to choose a nontrivial level of audit quality.

$= 0$. A report resulting from an indiscriminate attestation is always favorable. Such a report has no incremental information content and therefore investors do not update their priors about G, so that $p = \lambda$. The investors' posterior beliefs given an audited accounting report, auditor attestation, and audit quality are summarized as follows:

$$\begin{aligned}
&p(y_G, C, q) \equiv \Pr(G|y_G, C, q) = 1;\\
&p(y_B, C, q) \equiv \Pr(G|y_B, C, q) = \frac{\lambda(1-q)}{1-\lambda q};\\
&p(y_G, A, q) \equiv \Pr(G|y_G, A, q) = \frac{\lambda}{1-(1-\lambda)q};\\
&p(y_B, A, q) \equiv \Pr(G|y_B, A, q) = 0;\\
&p(y_G, IND, q) \equiv \Pr(G|y_G, IND, q) = \lambda.
\end{aligned} \tag{6}$$

Substituting the values of p from (6) into (5) yields investors' optimal investment as a function of auditor attestation and audit quality described below:

Claim 3:

(i) Given auditor conservatism and audit quality q, the investors' optimal investments given a favorable and unfavorable audited accounting report are, respectively:

$$k(y_G, C, q) = \mu^2; \tag{7}$$

$$k(y_B, C, q) = \left[\frac{\lambda(1-q)}{1-\lambda q}\right]^2 \mu^2. \tag{8}$$

(ii) Given auditor aggressiveness and audit quality q, the investors' optimal investments given a favorable and unfavorable audited accounting report are, respectively:

$$k(y_G, A, q) = \left[\frac{\lambda}{1-(1-\lambda)q}\right]^2 \mu^2; \tag{9}$$

$$k(y_B, A, q) = 0. \tag{10}$$

(iii) Given an indiscriminate auditor attestation, the investors' optimal investment is

$$k(y_G, IND, q) = \lambda^2\mu^2.$$

In order to gauge the nature and magnitude of investment inefficiencies, we use a full information regime as a benchmark. By full information, we mean an ideal situation in which the firm's financial condition is directly observable to investors so that $y_G = G$ and $y_B = B$. Using Equation (5), the full information levels of investments, given the firm's audited reports y_G and y_B, are $k^{FI}(y_G) = \mu^2$ and $k^{FI}(y_B) = 0$, respectively. Using these investment benchmarks, we measure the investment inefficiencies in the current setting in which the accounting reports do not always perfectly reveal the financial conditions.

Remark 3:

(i) Investors overinvest when a conservative auditor attests to an unfavorable report, i.e., $k(y_B, C, q) > k^{FI}(y_B)$, and investors underinvest when an aggressive auditor attests to a favorable report, i.e., $k(y_G, A, q) < k^{FI}(y_G)$.

(ii) A higher audit quality improves investment efficiency: both $|k(y_B, C, q) - k^{FI}(y_B)|$ and $|k(y_G, A, q) - k^{FI}(y_G)|$ decrease in q.

The intuition for Remark 3 is as follows. First consider the case of a conservative auditor. If the conservative auditor attests to a favorable report, then this report perfectly reveals the firm's favorable financial condition, such that investors make an efficient investment (i.e., $k(y_G, C, q) = k^{FI}(y_G) = \mu^2$). But if a conservative auditor attests to an unfavorable report, investors recognize that understatement is a possibility, so that they give the firm the benefit of the doubt and choose an investment level that is higher than they would have chosen if they knew for sure that the firm's financial condition is unfavorable; that is, the investors overinvest.

Now consider the case of an aggressive auditor. If an aggressive auditor attests to an unfavorable report, then that report perfectly reveals the firm's unfavorable financial condition, such that investors make an efficient investment (i.e., $k(y_B, A, q) = k^{FI}(y_B) = 0$). But if an aggressive auditor attests to a favorable report, investors realize that overstatement is a possibility so that they discount the report and choose an investment level that is lower than they would have chosen if they knew for sure the firm's financial condition is favorable; that is, the investors underinvest.

Regardless of the auditor's attestation, higher audit quality reduces the likelihood of both understatement and overstatement, thereby making the reports more representationally faithful and the investments more efficient.

Given the assumption of a competitive capital market, the price of the firm equals the investors' expected return on investment (gross return less the investment cost) plus their expected damage award due to any overstatement in the audited accounting report. The following claim describes the capital market pricing of the firm.

Claim 4:

(i) Given auditor conservatism and audit quality q, the capital market prices given favorable and unfavorable audited accounting reports are, respectively,

$$M(y_G, C, q) = \mu^2 \text{ and } M(y_B, C, q) = \left[\frac{\lambda(1 - q)}{1 - \lambda q}\right]^2 \mu^2.$$

(ii) Given auditor aggressiveness and audit quality q, the capital market prices given favorable and unfavorable audited accounting reports are, respectively,

$$M(y_G, A, q) = \left[\frac{\lambda}{1-(1-\lambda)q}\right]^2 \mu^2 + \frac{(1-\lambda)(1-q)}{1-(1-\lambda)q} L$$

and $M(y_B, A, q) = 0$.

(iii) Given an indiscriminate attestation, the capital market price is:

$$M(y_G, IND, q) = \lambda^2\mu^2 + (1-\lambda)L.$$

Claim 4 indicates how capital market prices react differently to the accounting reports due to differences in auditor conservatism and audit quality. In particular, the market does not take an accounting report at face value but rather interprets the same accounting report issued by a conservative auditor very differently from that issued by an aggressive auditor.

Demand for Auditing

We now turn to the following question from step 3 in Figure 2. Given the firm's desire to boost its expected market price and given that the market prices the firm very differently as auditor attestation and audit quality change, what kind of auditor attestation and what level of audit quality would the firm prefer? To answer this question, we first lay out the firm's expected payoff as a function of both auditor attestation and audit quality. We then derive the firm's demand for auditing. Recall that the firm's expected payoff is its expected capital market price less its expected auditor fees.

The case of auditor conservatism. As defined below, U_C represents the firm's expected payoff given auditor conservatism (C) and audit quality q:

$$U_C \equiv \underbrace{\lambda q}_{\substack{\text{probability}\\ \text{of } y_G}} \underbrace{\mu^2}_{\substack{\text{price}\\ \text{given } y_G}} + \underbrace{(1-\lambda q)}_{\substack{\text{probability}\\ \text{of } y_B}} \underbrace{\left[\frac{\lambda(1-q)}{1-\lambda q}\right]^2 \mu^2}_{\text{price given } y_B} - \underbrace{\lambda q}_{\substack{\text{probability}\\ \text{of } y_G}} \underbrace{\phi}_{\substack{\text{nonaudit}\\ \text{fee}}} - \underbrace{F}_{\substack{\text{noncontingent}\\ \text{audit fee}}}. \tag{11}$$

The case of auditor aggressiveness. As defined below, U_A represents the firm's expected payoff given auditor aggressiveness (A) and audit quality q:[18]

$$U_A \equiv \underbrace{[1-(1-\lambda)q]}_{\substack{\text{probability}\\ \text{of } y_G}} \underbrace{\left[\left[\frac{\lambda}{1-(1-\lambda)q}\right]^2 \mu^2 + \frac{(1-\lambda)(1-q)}{1-(1-\lambda)q} L\right]}_{\text{price given } y_G} + \underbrace{(1-\lambda)q}_{\substack{\text{probability}\\ \text{of } y_B}} \underbrace{0}_{\substack{\text{price}\\ \text{given } y_B}} - \underbrace{[1-(1-\lambda)q]}_{\substack{\text{probability}\\ \text{of } y_G}} \underbrace{\phi}_{\substack{\text{nonaudit}\\ \text{fee}}} - \underbrace{F}_{\substack{\text{noncontingent}\\ \text{audit fee}}}. \tag{12}$$

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[18] Given an indiscriminate attestation, the firm always expects to issue y_G and pay ϕ. Thus, its expected payoff is $M(y_G; IND, q) - \phi - F$, where $M(y_G; IND, q) = \lambda^2\mu^2 + (1-\lambda)L$ by Claim 4. Note that this payoff equals U_A when $q = 0$. Thus, from the firm's perspective, an indiscriminate attestation is a special case of auditor aggressiveness. Therefore, for the rest of the analysis, we can focus, without loss, on the conservative and aggressive attestations.

Claim 5:

(i) For any level of audit quality q, a firm with a high client business risk (i.e., $1 - \lambda \geq \frac{1}{2}$) prefers auditor conservatism and a firm with a low client business risk (i.e., $1 - \lambda \leq \frac{1}{2}$) prefers auditor aggressiveness.

(ii) The client firm prefers a higher audit quality: $\frac{\partial U_C}{\partial q} > 0$ and $\frac{\partial U_A}{\partial q} > 0$.

Claim 5 (i) can be interpreted as follows. The higher the client business risk—that is, the larger the value of $(1 - \lambda)$—the more likely the firm's financial condition will be unfavorable (B). From Figure 3, given an unfavorable condition, B, an aggressive attestation can produce either an unfavorable or a favorable report. If an unfavorable report is generated by an aggressive attestation, it will perfectly reveal the unfavorable condition. If a favorable report is generated by an aggressive attestation, even though the firm will be priced high, a legal liability will eventually be imposed on the auditor when the overstatement is exposed. Hence, the auditor demands a large fee from the firm to compensate for litigation risk, thereby offsetting the high market price. In sum, aggressiveness is not attractive to a firm with a high client business risk. On the other hand, conservatism produces an unfavorable report, y_B, for the unfavorable condition B. But because the market knows that the unfavorable report may be due to understatement, it gives the firm the benefit of the doubt and does not price it too low. Therefore, a firm with a high client business risk prefers conservatism to aggressiveness.

On the other hand, the lower the client business risk—that is, the smaller the value of $(1 - \lambda)$—the more likely the firm's financial condition will be favorable (G). Whereas a conservative attestation may understate the favorable condition, G, an aggressive attestation will not (see Figure 3). In other words, an aggressive attestation produces a report that more faithfully represents the firm's underlying favorable condition. Therefore, a firm with a lower business risk prefers an aggressive attestation to a conservative attestation.

An alternative interpretation of Claim 5 is from an investment efficiency perspective. The firm's expected payoff increases in its expected market price, which in turn increases in investment efficiency. Therefore, the firm prefers an auditor attestation that enhances its investors' investment efficiency. Claim 5 implies that, when client business risk is large ($1 - \lambda \geq \frac{1}{2}$, for any audit quality q, the firm values auditor conservatism more than auditor aggressiveness because its investors' investment decision is more efficient. Conversely, when client business risk is small ($1 - \lambda \leq \frac{1}{2}$), for any audit quality q, the firm values auditor conservatism more than auditor aggressiveness because its investors' investment decision is more efficient.

While Claim 5 (i) characterizes the firm's demand for auditor attestation, Claim 5 (ii) speaks of the firm's demand for audit quality. Recall that the firm's expected payoff increases in its expected market price, which, in turn, increases in investment efficiency. The larger the audit quality q, the more efficient is the investors' investment decision. Therefore, investors value audit quality, inducing the firm's preference for audit quality.

Fees and Equilibrium Auditing

Having derived the supply of and the demand for auditing, we characterize the equilibrium auditor attestation and audit quality. Claims 1 and 2 describe the supply of auditor conservatism and audit quality, respectively, while Claim 5 describes the demand for auditor conservatism and audit quality. The client firm uses ϕ to induce its auditor to *supply* the auditor attestation and audit quality *demanded* by the client. We now show how the firm chooses its optimal auditor fees (step 4 in Figure 2). The firm's optimal fees decision simultaneously determines the equilibrium auditor attestation and audit quality (step 5 in Figure 2).

Proposition 1:

(i) For a firm with high business risk (i.e., $1 - \lambda \geq \frac{1}{2}$), there exists a unique pair of fees $\{\phi_C, F_C\}$ that satisfies:

$$\phi_C = \left(\frac{1 - \lambda}{1 - \lambda q_C}\right)^2 \mu^2 \; s.t. \; \frac{\phi_C}{L} \leq 1 - \lambda, \tag{13}$$

$$F_C = c(q_C) - \lambda q_C \phi_C,$$

$$\frac{dF_C}{d\phi_C} < 0,$$

such that in equilibrium, (a) the auditor adopts a conservative attestation and (b) the unique audit quality q_C is characterized by:

$$\frac{\lambda(1 - \lambda)^2}{(1 - \lambda q_C)^2} \mu^2 = c'(q_C). \tag{14}$$

(ii) For a firm with low business risk (i.e., $1 - \lambda \leq \frac{1}{2}$), there exists a unique pair of fees $\{\phi_A, F_A\}$ that satisfies:

$$\phi_A = L - \left(\frac{\lambda}{1 - (1 - \lambda)q_A}\right)^2 \mu^2 \; s.t. \; \frac{\phi_A}{L} \geq 1 - \lambda, \tag{15}$$

$$F_A = c(q_A) - \lambda q_A \phi_A - (1 - q_A)[\phi_A - (1 - \lambda)L],$$

$$\frac{dF_A}{d\phi_A} < 0,$$

such that in equilibrium, (a) the auditor adopts an aggressive attestation and (b) the unique audit quality q_A is characterized by:

$$\frac{\lambda^2(1 - \lambda)}{(1 - (1 - \lambda)q_A)^2} \mu^2 = c'(q_A). \tag{16}$$

Proposition 1 implies that, in equilibrium, a firm with a particular level of client business risk (captured by $1 - \lambda$) chooses its optimal fees to induce a unique combination of auditor attestation and audit quality.

To see how such an equilibrium is achieved, consider a firm with high business risk (i.e., $1 - \lambda \geq \frac{1}{2}$). To maximize its payoffs, such a firm would set its auditor fees to induce its auditor to supply a conservative attestation and an audit quality, q_C. To induce conservatism, such a firm sets the level of ϕ below $(1 - \lambda)L$ (see Figure 4). The remaining task for the firm is to pinpoint a particular value of ϕ within the range of $\phi \leq (1 - \lambda)L$ to induce a particular level of audit quality. However, the firm faces a trade-off. On one hand, higher audit quality reduces the likelihood of misstatement in the accounting report (Remark

1 (ii)), thereby enhancing investment efficiency and the expected market price. This beneficial effect is captured by the left-hand side of Equation (14). On the other hand, higher audit quality entails higher audit cost that the client firm must cover with its auditor fees. This cost effect is captured by the right-hand side of Equation (14). This trade-off between investment efficiency and audit cost yields the unique level of audit quality q_C, which, in turn, pins down the level of the equilibrium nonaudit fee captured by Equation (13). Overall, the firm's optimal fees simultaneously determine the equilibrium auditor attestation and audit quality.

A by-product of Proposition 1 is that, in equilibrium, the audit fee and the nonaudit fee are negatively related, i.e., $\frac{dF_C}{d\phi_C} < 0$ and $\frac{dF_A}{d\phi_A} < 0$, and are therefore inherently linked. This linkage occurs because, for a lower nonaudit fee, the firm must raise the audit fee for the auditor to break even.

The following corollary demonstrates how the equilibrium audit quality and fees vary with (a) the client business risk, $1 - \lambda$, and (b) the scale to the return to investment, μ.

Corollary 1:

(i) $\frac{dq_C}{d\lambda} > 0$ and $\frac{dq_A}{d\lambda} < 0$; $\frac{dq_C}{d\mu} > 0$ and $\frac{dq_A}{d\mu} > 0$;

(ii) $\frac{d\phi_C}{d\lambda} < 0$, $\frac{dF_C}{d\lambda} > 0$, $\frac{d\phi_A}{d\lambda} > 0$, and $\frac{dF_A}{d\lambda} < 0$; $\frac{d\phi_C}{d\mu} > 0$, $\frac{dF_C}{d\mu} < 0$, $\frac{d\phi_A}{d\mu} < 0$, and $\frac{dF_A}{d\mu} > 0$.

The intuition for Corollary 1 (i) is as follows. As client business risk $(1 - \lambda)$ decreases, such that the client is more likely to have a favorable financial condition, the auditor's opportunity cost of losing such a client's business due to conservatism (a Type I error) increases, giving her more incentives to boost audit quality to decrease the likelihood of a Type I error $\left(\frac{dq_C}{d\lambda} > 0\right)$. On the other hand, as client business risk $(1 - \lambda)$ increases, such that the client is more likely to have an unfavorable financial condition, the auditor's risk of certifying such a client's report due to aggressiveness (a Type II error) increases, giving her more incentives to boost audit quality to decrease the likelihood of a Type II error $\left(\frac{dq_C}{d\lambda} < 0\right)$. In addition, as the scale of the firm's return to investment (μ) increases, the costs of her Type I and Type II errors increase, so the auditor chooses a higher audit quality $\left(\frac{dq_C}{d\mu} > 0 \text{ and } \frac{dq_A}{d\mu} > 0\right)$.

As for Corollary 1 (ii), when client business risk $(1 - \lambda)$ decreases, the likelihood of a Type I error increases, so the client chooses a higher contingent fee to motivate the auditor to select a higher audit quality $\left(\frac{d\phi_C}{d\lambda} < 0\right)$; to decrease the total expected fees to be paid, the client must therefore decrease the noncontingent audit fee $\left(\frac{dF_C}{d\lambda} > 0\right)$. On the other hand, when client business risk $(1 - \lambda)$ increases, the likelihood of a Type II error increases, so the client chooses a lower contingent fee to motivate the auditor to select a higher audit quality $\left(\frac{d\phi_A}{d\lambda} > 0\right)$; to make the total expected fees acceptable for the auditor, the client must therefore decrease the noncontingent audit fee $\left(\frac{dF_A}{d\lambda} < 0\right)$. In addition, when the scale of the return to investment (μ) increases, the costs of Type I and Type II errors increase. To induce the auditor to choose a higher audit quality, the client firm therefore chooses a larger contingent fee in the case of auditor conservatism and a lower contingent fee in the case of auditor aggressiveness $\left(\frac{d\phi_C}{d\mu} > 0 \text{ and } \frac{d\phi_A}{d\mu} < 0\right)$. Because the optimal noncontingent and contingent fees are inversely related, a larger scale of the return to investment results in a smaller noncontingent audit fee in the case of auditor conservatism and a larger noncontingent audit fee in the case of auditor aggressiveness $\left(\frac{dF_C}{d\mu} < 0 \text{ and } \frac{dF_A}{d\mu} > 0\right)$.

Referring back to Figure 2, we have investigated how the tension between auditor fees and auditor liability determines the supply of auditing and how the capital market interprets the audited accounting report in order to price the firm and to make its investment. We have further explored how the anticipation of the capital market's pricing rule generates the demand for auditing. In this subsection, we have completed the loop in Figure 2 by characterizing how the firm makes its auditor fee decision to implement its demand for auditing, which, along with the auditor's supply of auditing, determines the equilibrium auditor conservatism and audit quality.

IV. REGULATORY AND EMPIRICAL IMPLICATIONS

Our model offers some new perspective on the economic consequences of Section 201 of the Sarbanes-Oxley Act (SOX), which prohibits public companies from granting their auditors many nonaudit services. Section 201 proponents have claimed that, by using nonaudit services to exert pressure on their auditors, client firms may impair auditor independence and audit quality. Opponents have countered that restricting nonaudit services may be inefficient because it damages the synergy between audit and nonaudit services. We have deliberately assumed away any synergies between audit and nonaudit services and any direct benefits of nonaudit services to the client firm. We next show that, even without those benefits, restricting nonaudit services may still be detrimental.

Our analysis indicates that the regulatory concern about nonaudit services potentially damaging auditor independence and audit quality is partially valid. If we interpret a violation of auditor independence as the auditor biasing her opinion in favor of the client due to financial incentives, then auditor aggressiveness in our model is a violation of auditor independence. Specifically, if the nonaudit fee is high relative to the auditor's legal liability $\left(\frac{\phi}{L} \geq 1 - \lambda\right)$, then the auditor adopts an aggressive attestation (see Figure 3), in which case a larger nonaudit fee induces lower audit quality (see Figure 4). Nonetheless, our analysis shows that regulators are focusing on only one piece of the puzzle: the *supply* of auditing. We demonstrate that it is the joint forces of *supply and demand* that determine the equilibrium auditor attestation and audit quality. Specifically, we have shown that firms with high business risks induce auditor conservatism and, given auditor conservatism, a high level of nonaudit services increases audit quality.

If the equilibrium level of nonaudit fees is lower than that permitted by SOX, then regulations would have no impact. It remains an empirical question whether SOX restrictions on nonaudit services and fees are binding. In the following discussion, we discuss two scenarios in which SOX restrictions are binding.

- Scenario 1: A firm with high business risk induces auditor conservatism (Claim 5). From Figure 4, given conservatism, a lower fee results in lower audit quality. Thus, restricting nonaudit services decreases audit quality, q_C, thereby increasing the extent of overinvestment by investors (see Remark 3).
- Scenario 2: A firm with low business risk induces auditor aggressiveness (Claim 5). According to Figure 4, given aggressiveness, a lower fee results in higher audit quality. Thus, restricting nonaudit services may increase audit quality, q_A, thereby reducing the extent of underinvestment (see Remark 3). However, if the restriction on nonaudit services is too severe, then auditor aggressiveness may change to auditor conservatism, which would decrease the incidence of underinvestment and increase the incidence of overinvestment (see Remark 3).

These two scenarios illustrate that a one-size-fits-all requirement that restricts all public companies from granting their auditors many nonaudit services is generally suboptimal. The preceding analysis may also explain the inconclusive empirical evidence on the economic consequences of nonaudit services. For example, DeFond et al. (2002) find no association between the level of nonaudit fees and the auditor's propensity to issue a going-concern opinion. Similarly, Ashbaugh et al. (2003) and Chung and Kallapur (2003) find no association between the level of nonaudit fees and accounting quality. However, Frankel et al. (2002) document a negative association between the nonaudit fee to total fee ratio and accounting quality. Kinney et al. (2004) find that the association between the level of nonaudit fees and extent of restatements depends on the type of nonaudit services. While they find no association for financial information systems or internal audit services, they find a positive association for unspecified nonaudit services and a negative association for tax services.

Our model might explain the inconclusive nature of the preceding empirical evidence. We predict that, given auditor conservatism, nonaudit fees and audit quality are positively related while, given auditor aggressiveness, nonaudit fees and audit quality are negatively related. Therefore, it is possible that the mixed empirical evidence on the economic consequences of nonaudit services is due to the use of pooled samples in empirical studies that combine firms with aggressive and conservative auditors. For example, for those studies that do not document any significant association, it is likely that the average firm in the sample is equally likely to have either a conservative auditor or an aggressive auditor. In order to increase the statistical power of those tests, our model suggests that the sample of firms be partitioned into two subsamples: a subsample of firms with conservative auditors, and one with aggressive auditors. In particular, these partitioned samples may be used to test the following implications of Section 201.

Corollary 2: A mandatory (binding) restriction of the nonaudit fee, ϕ:

(i) increases auditor conservatism;
(ii) decreases a conservative auditor's audit quality, q_C, and increases an aggressive auditor's audit quality, q_A;

(iii) increases the extent of overinvestment, $|k(y_B, C, q_C) - k^{FI}(y_B)|$, and decreases the extent of underinvestment, $|k(y_G, A, q_A) - k^{FI}(y_G)|$; and

(iv) increases the audit fee, F.

V. CONCLUSION

We have developed a theoretical framework to investigate both the determinants and the consequences of auditor conservatism. We have shown that auditor conservatism and audit quality are simultaneously determined and are therefore inherently linked. In particular, we have shown that the equilibrium auditor attestation and audit quality depend on the firm's business risk. Furthermore, the equilibrium auditor attestation and audit quality affect the firm's market price and, therefore, its investment efficiency. We thus demonstrate that auditing plays a dual role (a price role and an investment role) and that these two roles are naturally intertwined. Our analysis also implies that a mandatory restriction of nonaudit services imposed by Section 201 of SOX may decrease audit quality and damage investment efficiency.

Our current model may be used as a springboard to investigate additional issues. For example, we have assumed that the firm and its auditor are symmetrically and imperfectly informed throughout the audit engagement. It is possible that the firm's insiders may have superior information relative to the auditor during the audit process. In such an information asymmetric setting, the disclosed audit/nonaudit fees could then reveal the firm's private information to outsiders. Studying such a setting may shed additional insights into the interactions among audit quality, auditor attestation, and investment efficiency.

Another limitation is that the model is static, such that the firm and its auditor only interact once. In practice, a client firm and its auditor interact over multiple periods. In a multiperiod model, the firm may sometimes propose a less favorable report in earlier periods to save for the future or may engage in reputation building by truthful reporting. Those incentives of the firm may affect auditor conservatism and investment efficiency, thereby altering the results derived in a static model. Investigating a multiperiod setting would enrich the current analysis and may provide further insights into the post-SOX world.

Overall, our analysis has illustrated the real effects of auditing. Both auditor conservatism and audit quality affect the information content of accounting reports. Accounting reports, in turn, affect investment decisions and therefore the firm's future cash flows. In that sense, auditing alters the very cash flows that it helps to predict.

APPENDIX
PROOFS

Proof of Remark 1

Refer to Figure 3. Remark 1 (i) is due to the fact that conservatism may produce understatement in the audited accounting report (i.e., report y_B may be issued for a firm with financial condition G) and aggressiveness may produce overstatement in the audited accounting report (i.e., report y_G may be issued for a firm with financial condition B). Remark 1 (ii) follows immediately from the probability of understatement ($\lambda(1 - q)$) and the probability of overstatement ($(1 - \lambda)(1 - q)$) (see Figure 3). Remark 1 (iii) is just a restatement of Claim 1. ■

Proofs of Claim 2 and Remark 2

The first-order condition of (1) with respect to q gives rise to $c'(q) = \lambda\phi$, which implies that $\frac{dq}{d\left(\frac{\phi}{L}\right)} > 0$. The first-order condition of (2) with respect to q gives rise to $c'(q) = (1 - \lambda)(L - \phi)$, which implies that $\frac{dq}{d\left(\frac{\phi}{L}\right)} < 0$. In the case of an indiscriminate attestation, as discussed in the text, the auditor's expected payoff is $\phi - (1 - \lambda)L - c(q)$, which implies that $q = 0$. ■

Proof of Claim 4

Recall that by the assumption of a competitive capital market, the price of the firm equals the investors' expected return on investment plus their expected damage award due to any overstatement in the accounting report.

Substituting the investors' optimal investment policy, (5), into the investors' objective function, $p2\mu\sqrt{k} - k$, yields:

$$p^2\mu^2, \tag{17}$$

which is the investors' expected return on investment. Recall that p is the investors' perceived probability of financial condition G, that is, $p = \Pr(G|\text{investors' informtion set})$.

By (6), $p(y_G, C, q) = 1$. Substituting it into (17) yields the market price, $M(y_G, C, q) = \mu^2$. Similarly, by (6), $p(y_B, C, q) = \frac{\lambda(1 - q)}{1 - \lambda q}$. Substituting it into (17) yields the market price, $M(y_B, C, q) = \left[\frac{\lambda(1 - q)}{1 - \lambda q}\right]^2 \mu^2$.

By (6), $p(y_G, A, q) = \frac{\lambda}{1 - (1 - \lambda)q}$. Substituting it into (17) yields the market's expected return on investment, $\left[\frac{\lambda}{1 - (1 - \lambda)q}\right]^2 \mu^2$. Furthermore, if an overstatement is exposed subsequently, the investors will receive a legal liability payment, L, from the auditor. Thus, the market price given a favorable report resulting from auditor aggressiveness is given by:

$$M(y_G, A, q) = \underbrace{\left[\frac{\lambda}{1 - (1 - \lambda)q}\right]^2 \mu^2}_{\text{expected return on investment}} + \underbrace{\frac{(1 - \lambda)(1 - q)}{1 - (1 - \lambda)q}}_{\text{probability of overstatement}} \underbrace{L}_{\text{damage award}}.$$

On the other hand, by (6), $p(y_B, A, q) = 0$. Substituting it into (17) yields the market price, $M(y_B, A, q) = 0$.

By (6), $p(y_G, IND, q) = \lambda$. Substituting it into (17) yields the market's expected return on investment, $\lambda^2\mu^2$. Furthermore, if an overstatement is exposed subsequently, the investors will receive a legal liability payment, L, from the auditor. Thus, the market price given a favorable report resulting from an indiscriminate attestation is $M(y_G, IND, q) = \lambda^2\mu^2 + (1 - \lambda)L$. ■

Proof of Claim 5

Proof of part (i): We rewrite the firm's expected payoffs expressed in (11) and (12), taking advantage of the assumption of a competitive audit market.

First, we study the case of auditor conservatism. Given the assumption of a competitive audit market, the auditor's expected payoff prior to the beginning of her engagement equals her reservation utility, which is normalized to 0. This implies that the auditor's expected payoff expressed in (1) plus her noncontingent fee, F, equals 0:

$$F + \lambda q \phi - c(q) = 0. \tag{18}$$

Thus, using (18), U_C in (11) can be rewritten as:

$$U_C = \frac{\lambda(\lambda + q - 2\lambda q)}{1 - \lambda q} \mu^2 - c(q). \tag{19}$$

Next, we switch to the case of auditor aggressiveness. Given the assumption of a competitive audit market, the auditor's expected payoff prior to the beginning of her engagement, the auditor's expected payoff expressed in (2) plus her noncontingent fee, F, equals 0:

$$F + \lambda q \phi + (1 - q)[\phi - (1 - \lambda)L] - c(q) = 0. \tag{20}$$

Thus, using (20), U_A in (12) can be rewritten as:

$$U_A = \frac{\lambda^2}{1 - (1 - \lambda)q} \mu^2 - c(q). \tag{21}$$

Finally, it follows that for any given q, $U_C \geq U_A$ if and only if $\lambda \leq \frac{1}{2}$. That is, when $\lambda \leq \frac{1}{2}$, for any given q, $U_C \geq U_A$, which implies that the maximal value of U_C is greater than the maximal value of U_A so that the client firm can and will choose auditor fees to induce auditor conservatism and maximize U_C. Conversely, when $\lambda \geq \frac{1}{2}$, for any given q, $U_C \leq U_A$, which implies that the maximal value of U_A is greater than the maximal value of U_C so that the client firm can and will choose auditor fees to induce auditor aggressiveness and maximize U_A. We show how the client firm sets its optimal auditor fees in Proposition 1.

Proof of part (ii): Taking the derivatives of the firm's expected payoffs expressed in (11) and (12) with respect to q yields the desired results. ■

Proof of Proposition 1

(i) Taking the derivative of the client firm's expected payoff given auditor conservatism, (19), with respect to q yields (14), which characterizes q_C. Because both sides of (14) are convex in q and the left-hand side of (14) is greater than the right-hand side at $q = 0$ and the right-hand side of (14) is greater than the left-hand side at $q = 1$, so both sides of (14) intersect only once, which means that q_C is unique.

Equating (3) and (14) yields $\phi = \left(\frac{1-\lambda}{1-\lambda q_C}\right)^2 \mu^2$. From Figure 3, $\frac{\phi_C}{L} \leq 1 - \lambda$ is necessary to induce auditor conservatism. Using (18), we obtain $F_C = c(q_C) - \lambda q_C \phi_C$. By the envelope theorem, we have $\frac{dF_C}{d\phi_C} = -\lambda q_C < 0$.

(ii) Taking the derivative of the client firm's expected payoff given auditor aggressiveness, (21), with respect to q yields (16), which characterizes q_A. The proof of the uniqueness of q_A is similar to the proof of the uniqueness of q_C above.

Equating (4) and (16) yields $\phi_A = L - \left(\frac{\lambda}{1-(1-\lambda)q_A}\right)^2 \mu^2$. From Figure 3, $\frac{\phi_C}{L} \geq 1 - \lambda$ is necessary to induce auditor aggressiveness. Using (20), we obtain $F_A = c(q_A) - \lambda q_A \phi_A - (1 - q_A)[\phi_A - (1 - \lambda)L]$. By the envelope theorem, we have $\frac{dF_A}{d\phi_A} = -\lambda q_A - (1 - q_A) < 0$. ■

Proof of Corollary 1

Taking the derivatives of (14), (16), (13), and (15) with respect to λ and μ, respectively, yields the desired results. ■

Proof of Corollary 2

Parts (i) and (ii) of the corollary follow immediately from Figures 3 and 4.

Recall that Claim 3(i) states that overinvestment may occur in the case of auditor conservatism and underinvestment may occur in the case of auditor aggressiveness. Therefore, part (i) implies part (iii). Furthermore, part (ii) and Claim 3 (ii) imply part (iii). In brief, part (iii) follows from (i) and/or (ii). Part (iv) follows trivially from the inverse relation between F and ϕ stated in Proposition 1. ■

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Are Independent Audit Committee Members Objective? Experimental Evidence

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ABSTRACT: We use experimental markets to examine stock-based compensation's impact on the objectivity of participants serving as audit committee members. We compare audit committee member reporting objectivity under three regimes: no stock-based compensation, stock-based compensation linked to current shareholders, and stock-based compensation linked to future shareholders. Our experiments show that student participants serving as audit committee members prefer biased reporting when compensated with stock-based compensation. Audit committee members compensated with current stock-based compensation prefer aggressive reporting, and audit committee members compensated with future stock-based compensation prefer overly conservative reporting. We find that audit committee members who do not receive stock-based compensation are the most objective. Our study suggests that stock-based compensation impacts audit committee member preferences for biased reporting, suggesting the need for additional research in this area.

Keywords: *audit committee; experimental economics; stock compensation.*

Data Availability: *The data and instructions from this study are available from the authors upon request.*

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I. INTRODUCTION

We use experimental markets to explore whether stock-based compensation affects the objectivity of participants acting as audit committee members (ACMs). We examine ACM objectivity under three specific regimes: no stock-based compensation, stock-based compensation tied to the earnings of current shareholders, and stock-based compensation tied to the earnings of future shareholders. These regimes correspond with common compensation packages observed in practice (e.g., cash, stock options, restricted stock, and unrestricted stock), allowing us to examine the effect of different stock-based incentives on ACM preferences for biased reporting.

Our motivation to examine ACM objectivity arises from three sources. First, the emphasis of the Sarbanes-Oxley Act of 2002 (SOX, U.S. House of Representatives 2002) on the audit committee's role suggests an increased need for a theory about the impact of ACM incentives on ACM objectivity. SOX requires that audit committees appoint, compensate, and oversee the external auditor (Section 301). It is particularly important to study the impact of stock-based compensation, as the National Association of Corporate Directors (NACD) currently encourages stock-based compensation for directors (Archambeault et al. 2008), and some companies are embracing such schemes to compensate directors. For example, Coca-Cola recently decided to compensate its board of directors, including the audit committee, with only performance-based bonuses.[1] A columnist criticized the new Coca-Cola director compensation program because the program creates incentives for board members to prefer aggressive reporting (Myerson 2006). Our experimental design specifically measures biased ACM reporting in order to explore this criticism.

Second, our experimental setting enables us to directly observe ACM objectivity, and to explore the impact of clearly defined incentive schemes on ACM reporting decisions. Prior archival research focuses on the association between observable ACM or board of director characteristics and proxies for financial reporting quality (Klein 2002; Abbott et al. 2004; Carcello and Neal 2003; DeZoort et al. 2002; Cullinan et al. 2008; Du and Jiang 2007; Archambeault et al. 2008). Our ability to observe objectivity directly provides stronger tests than are possible using archival measures of independence such as inside versus outside directors (Klein 1998, 2002) and proxies for bias such as restatements (Archambeault et al. 2008). Furthermore, the prior archival research does not consider the impact of ACM compensation on audit quality with the notable exception of Archambeault et al. (2008) who document a positive correlation between ACM stock incentives and restatements.

Finally, we extend the work of Mayhew and Pike (2004), who examine how investor selection of auditors impacts auditor objectivity. We modify their design to consider ACM objectivity, extending their research by separately considering how incentives tied to current versus future investors impacts decision-makers' preferences for biased reporting. Neither archival nor experimental research has separately examined incentives tied to the interest of current and future investors.

We employ three treatments in our experiment. In the Baseline treatment, the ACM receives only cash compensation. The other two treatments include cash compensation plus contingent compensation that parallels stock-based incentives.[2] In the second treatment (i.e., *Current* treatment), the ACM receives a bonus based upon the current investors' gains from selling their assets. Essentially, we link the ACM's incentives to current shareholders in a manner similar to owning unrestricted stock or vested stock options that can be sold immediately. In the third treatment (i.e., *Future* treatment), the ACM receives a bonus based upon future investors' gains from purchasing assets for less than their fundamental value, which is analogous to owning unvested stock options or restricted stock.[3]

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[1] Coca-Cola implemented a new incentive plan for board of director members. The board members' annual $175,000 in equity share units are only payable if the company meets the midpoint of its three-year target for earnings growth; if not, they get nothing (Myerson 2006). This type of compensation creates incentives for biased financial reporting that are very similar to those of management.

We observe the highest objectivity levels when ACMs receive no stock-based compensation. This result differs from prior research where participants in similar roles tend to bias reports toward the party that hires them (Mayhew et al. 2001; Mayhew and Pike 2004). ACMs do not bias reports toward current investors in the Baseline treatment. In contrast, when we tie ACM compensation to the earnings of current or future investors, the ACMs bias their reports. Specifically, when ACM earnings are tied to current investors' earnings, they aggressively bias reports in an apparent attempt to increase selling prices and the resulting earnings of current investors. In a similar sense, when we link ACMs' compensation to future investors' earnings, ACMs conservatively bias their reports to reduce selling prices that potentially increases the future investors' earnings at the expense of current investors. Subsequent analysis suggests current investors try to counteract the ACMs' bias toward future investors by hiring ACMs who agree with their reports more often in the *Future* treatment. It appears that ACM compensation that is not contingent on current or future shareholder returns leads to the highest level of ACM objectivity. This result appears to contrast with the prescriptions for effective monitoring under agency theory that call for linking the monitors' incentives with shareholders.

This research makes three important contributions. First, we aid ACM theory development, providing evidence that suggests stock-based compensation can impact ACM objectivity. Second, we provide evidence consistent with parallel archival research (Archambeault et al. 2008) that finds ACM stock options are associated with restatements. This triangulation strengthens the theoretical basis for questioning the impact of stock-based compensation on ACM objectivity. We show this not only applies to compensation tied to current investors like vested stock options, but also to compensation tied to future investors like restricted stock. Compensation tied to current investors leads to more aggressive reporting preferences and compensation tied to future investors results in more conservative reporting preferences. Third, we extend the existing experimental literature on biased reporting. Mayhew and Pike (2004) find that auditors hired by future investors are more objective than when hired by management. Their research suggests tying reporting responsibilities more closely to investors enhances objective reporting. The current paper shows that audit committee members are less objective when their compensation is linked to the returns of either current or future investors.

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[2] In half the sessions across all three treatments, the cash compensation is based upon competitive bidding by ACMs for the right to serve current investors. Based on comments during the review process, in the other half of the sessions the ACMs receive fixed cash compensation. This difference in the determination of cash compensation does not affect the results. We describe the difference in more detail in the experimental design section.

[3] We assume that current shareholders prefer good news now, as delayed announcement means some will sell their stock to future investors who will reap the benefits of the stock price (asset value) increase in response to the good news. While restricted stock and options will also increase in value given current good news, holders of restricted stock or unvested options cannot capture the increase immediately. We expect they will have a slight preference for delaying good news until the restriction lapses or the options vest.

In the next section, we outline the background and motivation, followed by a section describing the experimental design and explaining how our design choices capture the key constructs of interest. We then present and discuss the results of the experiment followed by the conclusion.

II. BACKGROUND AND MOTIVATION

In a 1998 speech, the then Chair of the Securities and Exchange Commission (SEC) Arthur Levitt stated, "qualified, committed, independent and tough-minded audit committees represent the most reliable guardians of the public interest" (Levitt 1998). In this same vein, Johnstone et al. (2001) claim, "Appropriately functioning boards of directors and audit committees should provide a neutral, well-informed buffer between auditors and management." Both statements implicitly express the idea that an independent audit committee can help external auditors remain independent and enhance the probability of objective financial reporting.

The Sarbanes-Oxley Act incorporates the above logic by placing responsibility for appointing, compensating, and overseeing the auditor on the audit committee's shoulders (Section 301). Proponents of the law argue that auditors cannot be independent from management if they are hired and fired by management (Bazerman et al. 1997).[4] Consistent with this view, prior experimental research suggests that auditor independence is sensitive to whether investors or managers hire the auditor (Mayhew and Pike 2004).[5] However, there has been relatively little theoretical attention to ACM objectivity.

A theory of ACM objectivity is nontrivial. There appears to be a logical inconsistency between what is considered optimal to maintain *auditor* independence and what is considered optimal for the *audit committee* that *oversees* the auditor. Professional standards ban auditors from owning stock in the companies they audit to preserve their independence (AICPA 2007). Some theorists also suggest that directors, including ACMs, *should* hold stock in the companies they oversee to align their incentives with shareholders (Fama and Jensen, 1983; Williamson 1984; Monks and Minow 2001). However, given the logic for auditors not owning stock, it seems rational to apply the same logic to the ACM. If owning stock can bias the auditor and management, it seems reasonable to infer that it can also bias an ACM.

The inconsistency arises because ACMs have potentially conflicting responsibilities. As members of the board of directors, ACMs oversee (1) the broad direction, strategy, and operation of the corporation, as well as (2) its compliance with laws, regulations, and standards, including financial reporting. The incentives that optimize one responsibility can conflict with incentives that optimize the other responsibility. The current study employs an experimental setting that focuses on ACM objectivity in monitoring reporting, toward the end of establishing empirical regularities to assist theorists in developing a more complete theory of ACM objectivity.[6]

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[4] We assume in our experiments that the ACM has sufficient influence over the auditors to affect financial reporting. SOX specifies that the auditor report to the audit committee all critical accounting policies, all alternative accounting principles discussions between the auditor and management, and all written communications between management and the auditor (SOX 2002, section 204). The Act's requirements clearly provide opportunity for the audit committee to significantly influence both financial reporting and the audit. As a result, we do not model the auditor separately from the ACM in our research design.

[5] Mayhew and Pike (2004) looked at the objectivity of the auditor when they were hired by management versus hired by investors. That paper took managerial preferences for biased reporting as given and was silent as to investor preferences. This paper looks at the preferences of investor representatives (independent audit committees who now explicitly have responsibility to hire and fire auditors) under various types of compensation.

Given the reinstituted emphasis on audit committee responsibility for managing the audit, we believe research that assesses the impact of different incentive schemes on ACM objectivity is needed. We examine whether differences in ACM compensation create preferences for objective, unbiased financial reporting. Like managers, ACM compensation typically consists of two forms of compensation: direct cash compensation and stock-based compensation.

ACM compensation can affect financial reporting preferences, and those preferences can influence the audit.[7] Direct cash compensation does not create direct incentives to prefer biased reporting. However, it can have an indirect effect if audit committee members under fixed compensation contracts believe that future appointments to the audit committee depend on biased financial reporting. It is less clear whether stock-based compensation leads to a preference for biased reporting. Some studies suggest that providing stock-based compensation to board members improves the firm's performance (Fich and Shivdasani 2005). However, stock-based compensation also has the potential to bias ACM preferences in the same way that stock-based compensation provides incentives for managers to report biased information. For example, Byard and Li (2005) find that boards of directors compensated with higher levels of stock options are less likely to constrain managers' opportunistic timing of news around stock-option grant dates.

III. EXPERIMENTAL DESIGN

Our study expands upon Mayhew and Pike's (2004) experimental design. Unlike Mayhew and Pike, who focus on *auditor* decisions, we treat the auditor as a fixed (but imperfect) technology. Our design focuses on observation and measurement of the individual ACM's preference for biased reporting. We intentionally focus on preferences for biased reporting and omit decisions related to overseeing management's operating and investing decisions.[8] Our design captures the essence of the ACM's decision process with respect to the objectivity of financial reporting (Swieringa and Weick 1982).[9] The use of markets similar to those studied in prior research (e.g., Dopuch et al. 1989; Mayhew 2001; Mayhew et al. 2001; Mayhew and Pike 2004) strengthens our inferences.

Our design incorporates four key strengths that facilitate building a better understanding of ACM objectivity. First, we employ multiple player types (i.e., ACMs, current investors, and future investors) who strategically interact in the experiment. Analytical approaches are generally unable to provide unique solutions to such complex settings. Our experiment enables us to document empirical regularities from these complex interactions that can facilitate theory building. Second, we directly observe ACM objectivity violations. Archival work must employ noisy proxies to infer ACM objectivity violations. Moreover, the proxies employed, such as discretionary accruals and restatements, are the joint product of managers, auditors, and ACMs such that it is difficult to assign responsibility for the observed outcomes. Third, we employ a multiple period experiment to allow for participant learning and market dynamics to form. Finally, we manipulate stock-based incentives to separately consider linkages to current and future shareholder returns. Such comparisons are difficult in archival settings in which it can be difficult to identify and measure the ACM's stock-based incentives.

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[6] We do not explore the potential gains that might arise from more competence in overseeing management to obtain greater long-term profitability. Klein (1998) provides evidence that insider directors who are generally considered less independent are associated with better firm performance when they are included on the BOD's investment and finance committees. Future research can consider the joint responsibility for overseeing financial reporting and overseeing operating performance.

[7] Bhagat et al. (1999) find, in a study of the S&P 500, the S&P Mid-Cap 400, and the S&P Small-Cap 600 that the majority of companies paid both base cash compensation and per meeting/committee fees. The mean amount in 1996 was $18,300 base and $1,000 per meeting. Many also offered equity compensation. Mean annual share grants in 1996 were 120 shares per director, but mean option grants were 2,220 per director. Williams (2005) finds, in a smaller sample of 200 S& P firms and 114 smaller firms, that 96 percent used stock or stock options to compensate their directors, and that the audit committee members were the most highly compensated.

[8] As members of the board of directors, ACMs in practice need to monitor both financial reporting and operations and investment. These two jobs may not always be compatible. In fact, some European countries require dual boards: one that oversees compliance and one that oversees operations and investment. There have been calls for adopting the two-board model in this country (Abdel-khalik 2002).

[9] Our experiment can be criticized for not fully capturing the decision context. But, it is important to note that our goal is to observe whether the fundamental incentives linking the ACM compensation via stock-based incentives creates an incentive to prefer biased reports.

We conduct two multiperiod markets in each session and six independent sessions within each treatment. Participants are paid for both markets, but we only use the second market in our analyses, although the first market leads to the similar inferences. The first market enables participants to fully learn the setting. The Baseline treatment follows the sequence outlined below for each period. Each step includes a brief explanation of the experimental purpose in italics. We tell participants the market will last 20 periods with certainty, with a 20 percent chance that any subsequent period will be the last period, but that the end period was determined prior to the experiment. We randomly select and pre-sequence the end period using the probabilities described, in a manner similar to King (1996). The audit committee in our study is a single individual decision-maker. We discuss this decision's implications in the results section.

1. Three individual ACMs submit prices to each of three current investors (i.e., Sellers) for serving as that investor's audit committee. An ACM can serve more than one current investor each period. ACMs bid from 0 to 1,000 and can bid differently across investors.[10] We revise this step in independent sessions 4, 5, and 6 of each treatment. In sessions 4–6, the ACM is paid a fixed fee of 60 when selected by a current investor. An ACM who is not selected receives 10. *Multiple bids to each current investor create competition among potential members in both compensation and quality. The payment to members not selected creates controlled opportunity costs and the resulting potential for participants to earn accounting profits (Mayhew and Pike 2004). We believe bidding for the committee position is a reasonable, although not exact, interpretation of how audit committee members obtain their positions. The fixed fees used in sessions 4–6 map directly to a posted offer market where firms offer audit committee positions to individuals. In the experiment, the ACM's reputation based on past objectivity represents a measure of quality that can influence the current investor's hiring decision.*[11]
2. Each of the current investors owns the result of a costly production process that they sell to future investors (i.e., buyers). The process produces an asset with a value of 1,000 50 percent of the time, and a value of 400 the other 50 percent of the time at a cost of 120. *In Mayhew and Pike (2004), a manager makes an*

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[10] The currency of trade in the markets is experimental dollars, which we convert directly to U.S. dollars at experiment end. We report all amounts in the paper in experimental dollars.

[11] We acknowledge that individuals do not necessarily bid to become ACMs. Technically, shareholders elect directors, but directors often run unopposed, suggesting the firms essentially select and compensate directors. Based on our own review of proxy statements, it appears that companies do not pay board members differentially unless the members serve on important committees such as the audit committee. To address potential criticism about bidding for the ACM position, we implemented sessions 4–6 where ACMs are selected and paid a fixed fee rather than bid for jobs.

investment decision at this step. We are modeling this player as a current investor who does not control the investment decision, but may have preferences about the report value. The uncertain return to investment creates risk and information asymmetry among participants.

3. Each current investor selects an ACM. Each current investor can hire any one (and only one) of the available ACMs, and there is no switching fee for changing from the prior period's choice. An ACM can serve more than one current investor. The current investor discloses the asset's value as 1,000 to the four future investors. *All asset values are reported as 1,000 based on the assumption that current investors always have at least a weak preference to report the value as high as possible. By misrepresenting low values as high, we create a role for ACM to monitor the information supplied to the market.*
4. ACMs incur a cost of 40 for reviewing the audit results. The robot auditor reports High (e.g., 1,000) or Low (e.g., 400) to the ACM. The auditor's report is correct (wrong) 80 percent (20 percent) of the time for each asset. *This cost proxies for the marginal effort necessary to oversee the auditor and expected litigation exposure. The probability that the information received by the ACM is correct provides a proxy for audit risks and accounting uncertainty.*[12]
5. Each selected ACM determines the report the robot auditor will issue. The report either agrees or disagrees with the current investor's 1,000 disclosure. *We assume that an ACM, in monitoring the auditor, can influence the report's objectivity. Mayhew and Pike (2004) show the auditor often biases his report toward the preference of the party that hires him. The ACM's report choice proxies for the ACM's influence on the auditor, as well the possibility of opinion shopping. This decision creates our observation of the ACM's objectivity.*
6. All potential future investors simultaneously receive the following information for each asset: the disclosure (always 1000), identification of the ACM serving that current investor, whether the audit report agrees or disagrees with the disclosure, and the fee paid to the committee member. *The future investors can use this information to develop a bid for the asset. The ACMs identification number enables the ACM to form a reputation for objective reports with the pool of potential future investors.*
7. Each potential future investor bids for each current investor's asset in a first-price sealed-bid auction. Potential future investors bid from 0 to 1,000 and can bid differently across the three current investor assets sold each period. Winning bidders earn the difference between their bid and the asset's actual value. For each period, potential future investors who do not purchase any assets earn 40. *We use the first-price auction for simplicity. It approximates a demand-revealing auction due to the number of bidders (4) and the common value of the asset. The payment of 40 to potential future investors who do not purchase assets creates controlled opportunity costs and the resulting potential for participants to earn accounting profits. The potential future investors' bids provide information about the credibility supplied by the ACM.*

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[12] In our research design, we base accounting uncertainty on both the inherent uncertainty of GAAP and the imprecise evidence received by the auditor. Analytically the concepts have an equivalent effect. It does not matter whether the source of the uncertainty is the result of some imprecision of GAAP, of GAAS, or of the audit evidence. All that is necessary is that the construct creates a degree of uncertainty in the proper accounting treatment. See Magee and Tseng (1990) for the analytical structure of the uncertainty and Calegari et al. (1998) and Mayhew et al. (2001) for experimental implementation of the construct.

8. All ACMs, current investors, and future investors observe the following information for each asset: the winning future investor's bid, the disclosed value, the auditor's report chosen by the ACM (agree or disagree), the ACM's identification number, and the asset's actual value. In addition, each period we provide a summary of how many times each ACM has served and how many times each ACM has been associated with an incorrect report. *All players receive the same set of information. Summary information about ACM performance simplifies record keeping for current and future investors.*[13] *The information received by both current and future investors about the accuracy of the ACM's report, can be used to assess the ACM reputation for objectivity. The ACM's reputation can then be used by current investors when hiring an ACM, and by future investors when bidding on assets reported upon by the ACM.*

We privately communicate exchange rates that are fixed within but vary across player types. Exchange rates range from \$3.33 to \$16.00 per E\$1,000 to balance dollar payments across treatments and player types. We endow current investors and ACMs with E\$400 and future investors with E\$3,600 to start each market.

The Baseline treatment establishes the base case in which ACMs receive the accepted bid or fixed compensation for serving as an ACM but no stock-based compensation. We report two different treatments that modify the Baseline design, a current shareholder treatment (*Current*), and a future shareholder treatment (*Future*). We design the two stock-based compensation treatments to capture basic incentives faced by independent ACMs. The differences are outlined below:

Current. Same as Baseline except that in addition to the cash compensation, the ACM receives a bonus equal to 25 percent of the current investor's end-of-period profits for which s/he is the ACM. This bonus aligns the ACM's incentives with the interests of current investors.

Future. Same as the Baseline except that the ACM receives a bonus equal to 25 percent of the purchaser's (i.e., future investor) profits on assets for which s/he is the ACM. This bonus aligns the ACM's incentives with the interests of future investors.[14]

In our design, ACMs monitor and issue the financial reports. Agency theory suggests that such monitoring is most effective when the incentives of the monitor are aligned with shareholders (Archambeault et al. 2008). This agency-based view suggests stock-based compensation should increase objective reporting. While the agency view suggests stock-based compensation should enhance objective reporting, prior research with related research designs suggests other potential outcomes.

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[13] We provide all the information at each period end. We believe that such information is also available in field settings. However, in field settings, users receive audit failure information with some time lag. The quicker feedback on information quality in our setting should make it harder for participants to take advantage of accounting uncertainty, or stated differently, should enable audit committee members to remain profitably objective. The increased time lag in field settings would likely lead to a greater lack of objectivity due to the delay in feedback about information quality.

[14] We do not discount future returns to keep the experiment simple. The incentives in the experiment are therefore stronger than they would be in practice where the present value of future returns based on future shareholder wealth would be lower than the undiscounted value. The 25 percent bonuses are paid to the ACM by the experimenter and do not reduce the earnings of the current or future investors directly. In practice, the payment of stock-like incentives to directors does reduce the wealth of current and future investors, however stockholdings of ACMs in practice are typically very small (i.e., less than 1 percent) resulting in little direct impact on investors' earnings.

Prior research has examined objectivity violations in similar settings (Mayhew et al. 2001; Mayhew and Pike 2004). The multiperiod setting combined with an uncertain end period precludes the identification of a unique Nash equilibrium; however, prior research has established some empirical regularities. The two most common pure strategy equilibria observed in prior research are (1) a lemons equilibrium in which the report issuer (i.e., ACM) has no credibility with potential future investors and thus the report does not affect bidding or final prices; and (2) a reputation equilibrium in which the reporter objectively issues reports revealing his information about the current investor's asset; and prices reflect the value implied by both the ACM issued auditor report, and the known uncertainty of the audit/reporting process (see Mayhew et al. [2001] for a more complete specification).

Institutional and contextual factors appear to drive which equilibrium is more likely to evolve. Mayhew et al. (2001) find that common knowledge of the auditor's lack of perfect information about asset values leads to lemons equilibrium formation. Mayhew and Pike (2004) find that future investor hiring leads to more objective reporting, consistent with a reputation equilibrium, than when managers hire the auditor. Similar to these two prior studies, the current experiments include common knowledge that the ACM does not receive perfect information about asset value from the auditor. Hence, investors are not able to perfectly interpret ACM reporting errors as bias. The main differences in the current study are the inclusion of stock-based compensation and replacing the auditor role with an ACM who is hired by current investors.

We briefly discuss the potential strategies and beliefs of each player type to provide some insight into the potential impact of our treatments. First, future investors bid for assets in a first price auction. Future investors evaluate whether the ACM's report contains unbiased information about asset value and the extent to which they will rely on or ignore the report. When future investors ignore the ACM report, their bid will reflect the underlying expected value of the asset less their opportunity cost. In our setting, the expected value of the asset is 700 and opportunity costs are 40 (i.e., 660).

A completely objective ACM report will be correct 80 percent of the time. As a result, future investors who fully rely on the report will bid 840 for an asset with a High (i.e., agree) report and 480 for an asset with a Low (i.e., disagree) report. Failure to incorporate the accuracy of the ACM's report can result in over- or under-bidding relative to others who correctly assess the expected accuracy of the report. In general, the competitive bidding process should result in winning bids that approximate the expected value of the asset, conditional on the ACM's report and past accuracy. The winning bids provide a measure of the future investors' perception of ACM objectivity.

Second, current investors look to maximize profits by maximizing the selling prices of their assets. In our setting, each current investor must report the asset value as 1000, so the only way for current investors to influence the selling price is via the ACM who is hired. A more objective ACM produces future investor bids that more accurately reflect the asset's value. While report accuracy impacts the bids, it also impacts the probability a High or Low report is issued, which also impacts the bids. That is, we expect future investor bids to respond to both the report type and accuracy. As a result, it is unclear how current investors will seek to use ACMs to influence bidding. Attempts to hire biased (i.e., aggressive) ACMs can lead to more High reports being issued, but at the same time will generally result in less reliance on the High reports and therefore lower bids on High reports.

We purposefully select different incentives for current investors than prior research. Mayhew and Pike (2004) model this player as a manager who also has an investment decision. The investment decision creates an incentive for the manager to hire more reputable auditors to separate themselves from managers who make low value investment decisions. The manager captures the surplus of higher investment through the increased reliability of the manager's report provided by a reputable auditor (Mayhew 2001). However, prior research suggests that despite the increased incentive to hire reputable auditors, managers often demand biased auditors (Mayhew 2001; Mayhew et al. 2001). In our setting, current investors parallel the manager player in prior research, but the current investors do not control the investment decision. They only control audit committee selection.[15] The current investors do not have incentives to hire an ACM with a reputation for objectivity to separate themselves from other current investors. This design choice enables us to focus on the ACM's reporting decision.

The removal of the investment decision also creates tension with respect to expected behavior. By removing the investment decision, we reduce current investors' motivation to prefer objective reporting. We expect this to increase the current investors' motivation to hire biased ACMs. However, current investors do not choose between low and high cost investment to generate the asset held for sale. As a result, they have less strategic reason to try to mislead future investors in an effort to reduce investment costs.

Third, ACMs face potentially conflicting incentives. That is, the actions that get ACMs hired do not necessarily maximize the ACMs' current-period payoffs. ACMs cannot earn profits without being hired. However, once hired, ACMs can choose to maximize their current-period wealth (resulting from current-period stock-based compensation) by making reporting decisions that reduce the likelihood of getting hired in the future. In the treatments where ACM compensation includes stock-based compensation, the ACMs' current earnings depend on the earnings of current or future investors. ACMs can choose to bias their reports in a manner that increases the potential earnings of investors they are aligned with through the stock-based incentives.

In the Baseline treatment, the ACMs' primary objective is to get hired by the current investors. ACMs in the Baseline have an indirect incentive to bias reports toward current investors based on the current investor's choice to hire the ACMs. ACMs in the *Current* treatment have both a direct and indirect incentive to bias reports toward current investors. Each ACM is hired by a current investor and receives an additional payment based on the current investor's profit. ACMs in the *Future* treatment have conflicting incentives. The ACMs have an indirect incentive to bias reports toward current investors who hire the ACMs and a direct incentive to bias reports toward future investors based on the additional payment tied to future investor profit. Our initial expectation is that these two conflicting incentives will offset, thereby producing the highest level of ACM objectivity.

While the above discussion suggests a directional hypothesis, we hesitate to make such a strong prediction because there is no unique equilibrium and the current investors' incentives when hiring the ACM are not clear. Instead, we investigate the general assertion that the treatments will produce differences in the ACMs' objectivity.

IV. RESULTS

We conduct six independent sessions in each of the three treatments. Each session utilizes unique participants in a between-subject design. We analyze the second market of each session. We treat the market-level data for each treatment as independent, while we treat the individual data within a market as non-independent. We adjust for clusters in our analysis to account for the lack of independence between individual ACMs in a given market.[16] Sessions 1, 2, and 3 in each treatment employ competitive biding by ACMs to become a current investor's ACM. In sessions 4, 5, and 6, the current investors select any of the three available ACMs for a flat E$60 fee. This difference does not affect any of our results, so we do not account for it in our analysis.

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[15] Current investors in modern corporations have little say over the investment choices of the corporations they own. At most, current investors can influence corporate investments via the election of the board of directors.

All participants receive a $5 show-up fee and up to an additional $2.50 for correctly answering ten quiz questions on the instructions to motivate careful attention. When recruiting subjects, we suggest to participants that they can expect to earn, on average, $10 to $12 per hour. Sessions lasted approximately 2-1/2 hours. Participants earned, on average, $34.73 per session. Participants in the fixed-fee sessions earn slightly less ($32.32) than the overall average and in the bidding sessions slightly more ($37.14).

Our primary question is whether, and to what extent, objectivity violations differ by treatment. Table 1 summarizes, by treatment, the objectivity violations for each session. Each session consists of three ACMs participating in 23 periods, for a total of 69 observations. We classify an observation as a violation if the ACM issues a report that differs from the audit result observed by the ACM. We separate violations into two types—aggressive and conservative. Both represent biased reporting. An aggressive violation occurs when the ACM agrees with the 1,000 report when the audit result shows Low. A conservative violation occurs when the ACM disagrees with the 1,000 report when the audit result shows High. When the ACM agrees or disagrees with the 1,000 report to reflect the observed audit result, there is no violation.

The descriptive statistics in Table 1 suggest variation in behavior across treatments. The Baseline markets average 6.04 percent violations and all but one are aggressive violations. Aggressive violations potentially benefit current investors by reporting asset values as High when the audit result says Low. The *Current* markets average 29.47 percent violations. All but two of the 122 violations are aggressive and benefit current investors. Finally, *Future* markets average 24.64 percent violations. Consistent with our discussion above about conflicting incentives for ACMs in the *Future* treatment, we observe both aggressive and conservative violations in these markets. The number of conservative violations in each *Future* session is greater than in any session within the other two treatments.

Aggressive and conservative violations can only occur under specific conditions. Aggressive violations can only occur when the robot auditor signals to the ACM that the asset is Low. We measure aggressive violations/chances as the number of aggressive violations divided by the number of Low audit signals. Conservative violations can only occur when the auditor signals the asset is High, so conservative violations/chances equal the number of conservative violations divided by the number of High audit signals. We calculate the violation rate based on the chances to commit each violation type in the last two columns of Table 1. This adjustment increases the aggressive violations to 60 percent in the *Current* treatment, and the conservative violations in the *Future* treatment to 29.26 percent.

Table 2, Panel A reports on analysis of variance, and Panel B provides tests of differences in means across treatments. We compare aggressive, conservative, and total violation rates separately. First, in the Baseline, we see fewer total violations than either the *Current*

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[16] The market-level data in our analysis consists of the individual ACM choices within that market (three ACMs per session). The individual ACM choices within a market are not independent of each other as each ACM can observe and react to the decisions of other ACMs. We treat each market as a cluster in our regression analysis to account for the non-independence of individual ACM decisions within that market. The net affect of clustering is to adjust the standard errors of the coefficients for the lack of independent observations within a market. See Stata 7 (Stata Corporation 2000, Reference Q-St, page 87) for details. Similar results can be obtained using PROC SURVEYREG in SAS.

TABLE 1
Audit Committee Member Objectivity Descriptive Statistics by Session

Treatment[a]	Periods	Aggressive Violations[b]	Conservative Violations[b]	Total Violations	Total % Violations	Test Shows High	Test Shows Low	Aggressive[c] Violations/Chances	Conservative[c] Violations/Chances
Baseline 1	69	1	0	1	1.45%	43	26	3.85%	0.00%
Baseline 2	69	11	0	11	15.94%	28	41	26.83%	0.00%
Baseline 3	69	3	0	3	4.35%	27	42	7.14%	0.00%
Baseline 4	69	1	1	2	2.90%	29	40	2.50%	3.45%
Baseline 5	69	0	0	0	0.00%	39	30	0.00%	0.00%
Baseline 6	69	8	0	8	11.59%	34	35	22.86%	0.00%
Baseline Mean					6.04%			11.21%	0.50%
Current 1	69	17	0	17	24.64%	40	29	58.62%	0.00%
Current 2	69	30	0	30	43.48%	34	35	85.71%	0.00%
Current 3	69	15	0	15	21.74%	37	32	46.88%	0.00%
Current 4	69	9	2	11	15.94%	34	35	25.71%	5.88%
Current 5	69	11	0	11	15.94%	39	30	36.67%	0.00%
Current 6	69	38	0	38	55.07%	30	39	97.44%	0.00%
Current Mean					29.47%			60.00%	0.93%
Future 1	69	2	17	19	27.54%	37	32	6.25%	45.95%
Future 2	69	9	17	26	37.68%	33	36	25.00%	51.52%
Future 3	69	0	6	6	8.70%	26	43	0.00%	23.08%
Future 4	69	11	6	17	24.64%	34	35	31.43%	17.65%
Future 5	69	0	6	6	8.70%	31	38	0.00%	19.35%
Future 6	69	25	3	28	40.58%	27	42	59.52%	11.11%
Future Mean					24.64%			20.80%	29.26%

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[a] Baseline ACM compensation is comprised of a contracted fixed fee only; the *Current*-treatment ACM compensation is comprised of a contracted fixed fee plus a bonus based on sellers' profits; and *Future*-treatment ACM compensation is comprised a contracted fixed fee plus a bonus based on buyers' profits.

[b] An aggressive violation is defined as an ACM report of 1,000, agree after observing test results showing Low (400), and a conservative violation is defined as an ACM report of 1,000, disagree after observing test result showing High (1,000).

[c] The Violations/Chances is potentially more informative than the percentage of violations based on the raw number of violations. It equals the violations as a percentage of the opportunities to commit a violation. The ACM only has a chance to reveal his/her bias toward current shareholders (i.e., aggressive reporting) when the ACM received information that the value is Low (i.e., 400) or his/her bias toward future shareholders (i.e., conservative reporting) when the ACM received information that the value was High (i.e., 1,000).

TABLE 2
Audit Committee Member Objectivity: Analysis of Variance

Panel A: Analysis of Variance[a]

Treatment[b]	Aggressive Violations/Chances[c] Mean	Aggressive Violations/Chances[c] t-stat	Aggressive Violations/Chances[c] p-value	Conservative Violations/Chances[c] Mean	Conservative Violations/Chances[c] t-stat	Conservative Violations/Chances[c] p-value	Total Violations/Chances[c] Mean	Total Violations/Chances[c] t-stat	Total Violations/Chances[c] p-value
Baseline (β_0^1)	0.112	2.49	0.024	0.005	1.03	0.316	0.060	2.49	0.023
Current (β_0^2)	0.600	5.18	0.000	0.009	1.05	0.307	0.295	4.76	0.000
Future (β_0^3)	0.208	2.16	0.045	0.293	6.23	0.000	0.246	4.68	0.000
Number of observations and overall significance	n = 18	F = 12.57	0.000	n = 18	F = 7.33	0.002	n = 18	F = 16.92	0.000
R^2	40.90%			26.44%			38.79%		

Panel B: Significance Tests

	Aggressive Violations/Chances[c] Comparison	Aggressive Violations/Chances[c] p-value[d]	Conservative Violations/Chances[c] Comparison	Conservative Violations/Chances[c] p-value[d]	Total Violations/Chances[c] Comparison	Total Violations/Chances[c] p-value[d]
Baseline (β_0^1) = *Current* (β_0^2)	0.112 = 0.600	0.001	0.005 = 0.009	0.673	0.060 = 0.295	0.003
Baseline (β_0^1) = *Future* (β_0^3)	0.112 = 0.208	0.380	0.005 = 0.293	0.000	0.060 = 0.246	0.005
Current (β_0^2) = *Future* (β_0^3)	0.600 = 0.208	0.019	0.009 = 0.293	0.001	0.295 = 0.246	0.560

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[a] We use clustering to analyze the results because there are three subjects within each market, whose decisions are not independent of each other, and repeated decisions by each subject. We use a regression to analyze the variance, with robust estimation of the variance and a correction for the number of independent clusters. See Stata 7 (Stata Corporation 2000, Reference Q-St, page 87) for details.

[b] Baseline ACM compensation is comprised of a flat fee; the *Current*-treatment ACM compensation is comprised of a flat fee plus a bonus based on sellers' profits; and *Future*-treatment ACM compensation is comprised a flat fee plus a bonus based on buyers' profits.

[c] The Violations/Chances equals the violations as a percentage of the opportunities to commit a violation. The ACM only has a chance to reveal his/her bias toward current shareholders (i.e., aggressive reporting) when the ACM received information that the value is Low (i.e., 400) or his/her bias toward future shareholders (i.e., conservative reporting) when the ACM received information that the value was High (i.e., 1,000).

(p = .003) or the *Future* (p = .005). This finding suggests that stock-based compensation produces more biased reporting than straight cash compensation. Second, we see the most violations in the *Current*. The *Current* aggressive violations rate is significantly more than either the Baseline (p = .001) or the *Future* (p = .019). It appears that tying ACM compensation to current shareholders results in a preference for biased aggressive reporting. The difference in aggressive violations between the Baseline and the *Future* (p = .380) is not significant. Finally, the *Future* produces the vast majority of conservative violations. The percentage of conservative violations is statistically greater than either the Baseline or *Current* treatments (p < .001). We also examine whether violations vary over time within a session. We find no evidence of significant variation across the 23 periods.

In summary, our treatments document that stock-based compensation results in ACMs who bias their reporting in the direction of the stock-based compensation. Incentives tied to current investors increase preferences for aggressive financial reporting, while incentives tied to future investors increase ACMs' preferences for overly conservative reporting. Somewhat surprisingly, cash compensation produces objective reporting even though current investors hire the ACM.

Group versus Individual Decision Making

Our experiments focus on the preferences of individual decision makers for biased financial reporting. However, audit committees are groups of individuals who make audit-related decisions. There is a large body of literature (for summaries, c.f., Isenberg 1986; Myers 2002) on how group decisions systematically differ from the individual preferences of their members. The literature refers to this phenomenon as "risky shift" or more generally, "group polarization" since the shift may be toward more caution. Essentially, the literature suggests that group discussions often strengthen individuals' initial preferences or beliefs leading to group decisions that are more polarized or extreme than would be suggested by taking the average of the individuals' preferences. This literature suggests we are likely to understate the differences across treatments by looking at individuals instead of groups. If biased reporting represents a risk, then groups made up of individuals with a preference for biased reporting will be more likely to bias their reports than the individuals that make up the group.[17]

We observe widespread biased reporting in the *Current* and *Future* treatments. Untabulated individual decisions show that in the *Current* and *Future* treatments, 29 out of 36 ACMs exhibit bias and 16 of the 29 bias their reports more than 50 percent of their opportunities. In contrast, in the Baseline treatment ten of 18 ACMs never exhibit bias, and of the eight that do, only one exceeds 50 percent of his opportunities. This suggests that in the *Current* and *Future* treatments, group polarization would *increase* the amount of biased reporting, while in the Baseline it would likely *decrease* the bias. Thus, we believe the use of committees would produce even stronger results than our individual-based approach.

Comparison to Mayhew and Pike (2004)

This section briefly connects this research to Mayhew and Pike (2004). We design the current experiments specifically to capture the essence of ACM decisions and preferences, while the Mayhew and Pike design captures the key aspects of auditor decisions. However, the key construct in both papers is the decision-makers' preference for biased financial reporting, as represented by objectivity violations. Based on the similarity of that construct across studies, we offer a couple of observations.

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[17] ACMs in our treatments face risk of current investors not hiring the ACM in subsequent periods. We give the current investors who hire the ACMs information about the ACMs' prior reporting; therefore, the ACMs' reporting decisions involve risk.

First, the conversion from the manager selection of auditors in Mayhew and Pike (2004) to the current investors' selection of ACMs changes the ACMs' actions compared to the choices by auditors in Mayhew and Pike. It appears that the strategic investment choice in Mayhew and Pike that we remove is key to differentiating between modeling the hiring decision as one by a manager versus a current investor. The result is that the Baseline rate of violations in this paper (6.04 percent) is essentially identical (7.25 percent) to the *Investor Selection NMH* treatment in Mayhew and Pike (2004). Both papers suggest that hiring by investors increases objectivity as long as there is no stock-based compensation. Second, Mayhew and Pike (2004) observed only three individual conservative violations, and those violations occurred in two different treatments. In contrast, we observe three or more conservative violations (total of 55) in each of the six *Future* sessions. This evidence strengthens the inference that tying ACM compensation directly to future shareholders increases their preference for conservatively biased financial reporting.[18]

Market Participant Behavior and Sensitivity

In this section, we examine the behavior of the individual market participants. We specifically consider the implications of the current and future investors' actions on the ACMs' behavior, as well as how the ACMs' behavior impacts investors. The purpose of these analyses is twofold. First, we want to better understand the market dynamics across treatments. Second, we want to evaluate whether the other players' behavior impacts ACM decision making in unexpected ways. This helps ensure the treatments cause differences in ACM behavior rather than some unusual behavior on the part of current or future investors.

The ACM maximizes earnings in our setting by getting hired by a current investor. We examine whether the ACMs' prior reporting decisions influence hiring decisions. Srinivasan (2005) provides evidence that following financial statement restatements, audit committee members are less likely to remain on the restating firm's board, and they are more likely to leave other boards especially when the restatement is severe. This finding suggests that in extreme cases of biased financial reporting, ACMs are punished by the audit committee labor market. However, we are unaware of any evidence on the impact of less severe earnings management (such as abnormal accruals) on ACMs' job opportunities.

We assess the probability of an ACM getting hired based on his/her past record of accuracy and agreement in the market by estimating Equation (1):[19]

$$\begin{aligned} Prob(Hired_t) = f(&\phi_1 + \phi_2 \%Accuracy_{t-1} + \phi_3 \%Agree_{t-1} \\ &+ \phi_4 \%Accuracy_{t-1} * Current_t + \phi_5 \%Accuracy_{t-1} * Future_t \\ &+ \phi_6 \%Agree_{t-1} * Current_t + \phi_7 \%Agree_{t-1} * Future_t + v_t) \end{aligned} \tag{1}$$

where:

Hired = 1 if the ACM is hired in the current period, and 0 otherwise;
%Accuracy = percentage of accurate reports issued by the ACM through the prior period;

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[18] Mayhew and Pike (2004) indirectly tie auditors' incentives to future investors by requiring future investors to make the hiring decision.

[19] We delete the first ten periods of every market to allow reputations for each ACM to form.

%Agree = percentage of agree reports issued by the ACM through the prior period;
Current = 1 if the ACM is paid a bonus based on current-investor profits, and 0 otherwise; and
Future = 1 if the ACM is paid a bonus based on future-investor profits, and 0 otherwise.

We pool data from all three treatments and use interaction terms to separate the effects of the two stock-based incentive treatments. This approach allows us to evaluate hiring differences across treatments. We include measures of both accuracy and agreement in the same model. This approach allows us to consider both the ACMs' reputation for accuracy as well as their willingness to agree with current investors. The two measures are negatively correlated ($r = -0.27$). That is, high levels of agreement generally will cause the ACM to be less accurate. A positive coefficient on *%Accurate* suggests current investors prefer to hire ACMs who report accurately. We use accuracy rather than total violations because current investors cannot observe violations directly due to the imperfect information received by ACMs. Accuracy is negatively correlated with total violations (-0.85). We will observe a positive coefficient on *%Agree* when current investors prefer to hire ACMs who agree with their reports. We control for the lack of independence within individual market sessions by clustering at the market level.

Table 3 reports the results form estimating Equation (1). The *%Accurate* measure is positively associated with being hired in the Baseline. However, the interactions between *%Accurate* and the two treatment variables suggest that accuracy is not as important when hiring ACMs in the *Current* or *Future* treatments. The *%Accurate * Current* interaction term is not significant at conventional levels ($p = 0.115$, two-tailed). The *%Accurate * Future* interaction is significantly negative ($p = 0.063$), suggesting a lower preference for accurate ACMs in the *Future* treatment. In contrast, *%Agree* is insignificant in the Baseline and the *Current* treatment ($p = 0.186$, two-tailed) but is significant in the *Future* treatment ($p = 0.018$).[20] The positive coefficient on *%Agree * Future* suggests that current investors try to create incentives for ACMs to not bias toward future investors by hiring ACMs who agree with the current investors reports.

The difference in hiring preferences across treatments may reflect the choices available to current investors. In the Baseline treatment, current investors appear to prefer accurate ACMs rather than ACMs who agree. As we describe earlier, this result may be due to the lack of strategic investment choice faced by current investors in prior research. However, in the Baseline, very few ACMs regularly violate their objectivity, so current investors have little choice when searching for a biased ACM. In the stock-based treatments, current investors have the opportunity to hire biased ACMs and do so, but do not have much choice of unbiased ACMs. Consistent with prior experimental research, we allow the ACMs' choice to be objective to arise endogenously in our design. The current investor's hiring preferences could be explored further in research designed to specifically evaluate the hiring choices with exogenously determined ACM reputations for agreement and accuracy.[21]

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[20] Our interpretation of the interactions in Equation (1) is robust to the concerns raised by Ai and Norton (2003).

[21] Our result may appear to contrast with Srinivasan's (2005) finding that ACMs appear to lose board positions after revelations of biased reporting in the form of restatements. However, it is important to note that Srinivasan's (2005) finding only applied to the most severe and public cases of bias. In our setting, the bias is less severe, especially given the fact that the ACM can be wrong due to incorrect information from the robot auditor. We think it would be helpful to investigate this finding further with archival data especially with respect to less severe forms of earnings management. The exploration of demand for reporting objectivity can also be explored using the auditor-manager setting employed in prior research.

TABLE 3
Analysis of Verifier Reputations for Accuracy and Agreeing with Seller in Prior Periods on the Seller's Hiring Decision

$$\begin{aligned} Prob(Hired_t) = f(&\phi_1 + \phi_2\%Accuracy_{t-1} + \phi_3\%Agree_{t-1} + \phi_4\%Accuracy_{t-1} * Current_t \\ &+ \phi_5\%Accuracy_{t-1} * Future_t + \phi_6\%Agree_{t-1} * Current_t \\ &+ \phi_7\%Agree_{t-1} * Future_t + v_t) \end{aligned}$$

Variables	Prediction	Coefficient Estimate	z-statistic	p-value[b]
Intercept		−2.258	3.36	0.001
%Accuracy	+	2.276	2.52	0.012
%Agree	+	0.225	0.27	0.790
*%Accuracy * Current*	?	−1.032	−1.58	0.115
*%Accuracy * Future*	?	−1.300	−1.86	0.063
*%Agree * Current*	?	1.115	1.32	0.186
*%Agree * Future*	?	2.469	2.37	0.018

[a] We use clustering to analyze the results because there are three subjects within each market, whose decisions are not independent of each other, and repeated decisions by each subject. We use a regression to analyze the variance, with robust estimation of the variance and a correction for the number of independent clusters. See Stata 7 (Stata Corporation 2000, Reference Q-St, page 87) for details.

[b] p-values are based on two-tailed tests.

Variables Definitions:

Hired = 1 if the verifier is hired in the current period, and 0 otherwise;
%Accuracy = ratio for all periods prior to the current period of verifier *i* issuing an accurate report to the total number of times verifier *i* was hired;
%Agree = ratio for all periods prior to the current period of verifier *i* issuing a report that agrees with seller to the total number of times verifier *i* was hired;
Current = indicator variable equal to 1 if ACM compensation is comprised of a bonus based on sellers' profits, and 0 otherwise; and
Future = indicator variable equal to 1 if ACM compensation is comprised of a bonus based on buyers' profits, and 0 otherwise.

We delete the first ten trading periods from this analysis to allow reputations for verifier accuracy to form (i.e., we use data from the last 13 periods of trading only).

We assess future investors' reliance on the ACM's report based on the ACM's past history at both the market level and individual level in Tables 4 and 5. Table 4, Panel A shows the market-level mean winning bids by report type and treatment. Across the three treatments, bids for High and Low reports are significantly different from the expected asset value if future investors ignored reported values (i.e., 660).[22] Future investors pay significantly more for High reports compared to Low reports within each treatment. This evidence suggests that future investors rely on the information provided by the ACMs in all three treatments. There are two significant differences between treatments. First, future investors pay less for High reports (1,000; agree) in the *Current* treatment than the Baseline, consistent with future investors discounting the ACMs' reports because of higher levels of aggressive objectivity violations in the *Current* treatment. Second, future investors pay more

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[22] If investors do not rely on ACM reports at all, then acquirers would bid the asset's expected value (700) less their opportunity cost (40) (i.e., 660).

TABLE 4
Analysis of Winning Buyer Bids

Panel A: Mean Winning Buyer Bids by Treatment and Report Type

Treatment[a]	Report Type: High Report	Report Type: Low Report
Baseline	839	478
Current	760	523
Future	815	568

Tests of Means	Winning Bid When Report is High: Comparison	p-value[b]
Baseline versus *Current*	839 versus 760	0.059
Baseline versus *Future*	839 versus 815	0.571
Current versus *Future*	760 versus 815	0.256

Tests of Means	Winning Bid When Report is Low: Comparison	p-value[b]
Baseline versus *Current*	478 versus 523	0.281
Baseline versus *Future*	478 versus 568	0.001
Current versus *Future*	523 versus 568	0.234

Panel B: Tests of Mean Winning Buyer Bids versus Expected Winning Buyer Bid if Audit Committee Member is Always Honest (assuming opportunity costs are fully incorporated into each bid)

Treatment	p-value[c]
Winning Bid When Report is High	
Baseline (839) versus 840[e]	0.480
Current (760) versus 840	0.011
Future (815) versus 840	0.243
Winning Bid When Report is Low	
Baseline (478) versus 480[e]	0.932
Current (523) versus 480	0.238
Future (568) versus 480	0.000

[a] Baseline ACM compensation is comprised of a flat fee bid; the *Current*-treatment ACM compensation is comprised of a flat fee bid plus a bonus based on sellers' profits; and *Future*-treatment ACM compensation is comprised a flat fee bid plus a bonus based on buyers' profits.

[b] p-values are based on two-tailed tests.

[c] p-values are based on one-tailed tests.

[e] Expected value of asset if verifiers are always honest and investors incorporate opportunity cost: High Report = 840 = (1,000 × 80% + 400 × 20%) − 40; Low Report = 480 = (400 × 80% + 1,000 × 20%) − 40.

for Low reports (400; disagree) in the *Future* treatment than the Baseline, consistent with conservatively biased Low reports in the *Future* treatment.

Table 4, Panel B compares market-level winning bids to the expected winning bid if ACMs reported objectively. Future investors who believe the ACM is fully objective should bid 880 less their opportunity cost (i.e., 840) for High reports. Future investors submit winning bids that are not significantly different than 840 in the Baseline ($p = .480$) and *Future* ($p = .243$) treatments. In the *Current* treatment, winning bids are significantly less than 840 ($p = .011$). Future investors who believe the ACM is fully objective should bid 480 for a Low report. Investors in the *Future* treatment bid significantly greater than 480 ($p < .001$), while their bids do not differ from 480 in the Baseline and *Current* ($p = .932$ and $p = .238$). Future investors appear to bid greater than 480 in the *Future* treatment because conservatively biased Low reports result in future investors receiving high assets more often than expected based on objective reports.

We explore the impact of individual ACM reputations for accurate reporting in Table 5. We examine whether the high bid for each asset is a function of the ACM's prior history of accuracy and type of report issued. This information provides insight into whether bidding by future investors has an influence on ACM behavior. We estimate the following regression:

$$\begin{aligned} Highbid_t = {} & \phi_1 + \phi_2 High\ Report_t + \phi_3 \%Accuracy_t \\ & + \phi_4 \%Accuracy * High\ Report_t + \kappa_t \end{aligned}$$

where *Highbid* equals the winning bid for asset *i* in period *t*, *High Report* equals 1 for High reports issued by the ACM, and 0 for Low reports, and *%Accuracy* is as previously defined.

We begin by pooling data across all three treatments. This gives us more variation in observed levels of ACM accuracy than when we segregate the data by treatment. The results in Panel A of Table 5 suggest that future investors bid very close to expectations and appear to take into account both the observed report type and ACM accuracy. First, we note that the intercept of 658.5 is very close to the expected value of the asset (660) independent of report type, or accuracy, less opportunity costs. This suggests that overall bidding approximates expectations. Second, it appears that future investors take into account ACM accuracy and report type when bidding on assets. The *%Accuracy * High Report* interaction is significantly positive ($p < 0.001$), suggesting that Agree reports by accurate ACMs result in higher bids. Also, *%Accuracy* is significantly negative ($p = .011$), suggesting that future investors bid less for more accurate Low reports.

Panel B of Table 5 reports the bidding within each treatment. In general, the patterns are similar to the overall analysis, but there are some exceptions. First, the Baseline does not appear to assign a significant weight to *%Accuracy * High Report.* At first glance, this finding suggests that future investors did not care about ACM accuracy in the Baseline. We think this interpretation is incorrect. In the Baseline, there is little variation in ACM accuracy, and ACM accuracy is generally very high. As a result, the small variation in ACM accuracy has little impact on bids. Second, the *Current* treatment appears to have no significant association between bids and either report type or accuracy. Hence, future investors appear to largely ignore the reports consistent with the high rate of objectivity violations in this treatment. Third, the *Future* treatment shows a significant reaction to High reports interacted with accuracy. This result is consistent with the overall result. However, it appears that future investors place more faith in High reports, possibly because *Future* treatment ACMs have incentives to bias toward Low reports. The bias toward Low reports potentially makes High reports more believable, especially when issued by more accurate ACMs.

Limitations

Our study has the following limitations. First, audit committees typically make decisions as a group rather than a single individual. There is a large literature that documents

TABLE 5
Analysis of Verifier Reputation for Accurate Reporting on Winning Buyer Bids

Panel A: Winning Bids with Pooled Reports (n = 702)

$$Highbid_t = \phi_1 + \phi_2 High\ Report_t + \phi_3 \%Accuracy_t + \phi_4 \%Accuracy * High\ Report_t + \kappa_t$$

Variables	Prediction	Coefficient Estimate	t-statistic	p-value[b]
Intercept	+	658.5	14.88	< 0.001
High Report		−84.4	−1.64	0.120
%Accuracy		−169.7	−2.87	0.011
*%Accuracy * High Report*		489.8	7.75	< 0.001

Panel B: Winning Bids by Treatment

Variables	Prediction	Coefficient Estimate	t-statistic	p-value[b]
Baseline (n = 234)				
Intercept	+	498.5	7.03	< 0.001
High Report		258.2	3.58	0.016
%Accuracy		−31.7	−0.29	0.784
*%Accuracy * High Report*		150.6	1.67	0.155
Current (n = 234)				
Intercept	+	745.2	3.54	0.017
High Report		−135.8	−0.59	0.584
%Accuracy		−302.4	−1.16	0.297
*%Accuracy * High Report*		529.5	1.73	0.145
Future (n = 234)				
Intercept	+	647.9	14.43	< 0.001
High Report		−102.1	−1.48	0.200
%Accuracy		−86.0	−1.24	0.270
*%Accuracy * High Report*		462.8	4.22	0.008

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[a] We use clustering to analyze the results because there are three subjects within each market, whose decisions are not independent of each other, and repeated decisions by each subject. We use a regression to analyze the variance, with robust estimation of the variance and a correction for the number of independent clusters. See Stata 7 (Stata Corporation 2000, Reference Q-St, page 87) for details.

[b] p-values are based on two-tailed tests.

Variables Definitions:

Highbid = winning buyer bid;

High Report = 1 if verifier *i* issued a report that agreed with the seller's report, and 0 otherwise; and

%Accuracy = percentage of time ACM reported accurately in the periods prior to the current period.

We delete the first ten trading periods from this analysis to allow reputations for verifier accuracy to form (i.e., we use data from the last 13 trading periods only).

differences between group and individual decisions. Based on theories on group decision making and our individual data, we believe a group-based design would be unlikely to produce different results.

Second, we suppress liability-based incentives that are present in field settings. ACMs have a fiduciary responsibility to shareholders that makes them liable for their actions. This liability may offset the preference for biased financial reporting that we observe. However, ACMs are often covered by directors and officers insurance that may mitigate the liability threat. Srinivasan (2005) reports little evidence of board members being named in lawsuits associated with restatements and less evidence of payouts by board members for such lawsuits.

Third, we suppress the interaction between the audit committee and auditor. While we believe the audit committee can exert substantial influence over the auditor, the PCAOB also has influence on auditors of public companies. PCAOB oversight reduces the auditors' incentive to facilitate biased financial reporting even if preferred by the audit committee. Future research can examine this interaction.

Fourth, we do not investigate the potential trade-offs of removing stock-based compensation from board members. While stock-based incentives can increase an ACM's preference for biased reporting, such incentives may also produce more value-enhancing operating and investing decisions by board members. Finally, other factors such as wealth and reputation may impact ACM objectivity in field settings. To the extent ACM wealth far exceeds the value of their audit-committee-related holdings, they have less incentive to demand biased reporting. We also do not manipulate the impact of ACM reputation. We allow ACM reputations to form, but do not manipulate incentives for reputation formation.

V. CONCLUSION

We use experimental markets to study the impact of stock-based compensation on ACM objectivity. We assume that through its monitoring role, the audit committee can influence auditors and thereby encourage or discourage biased financial reporting. Our experiments show that ACMs prefer biased reporting when paid with stock-based compensation. ACMs paid with stock-based compensation similar to unrestricted stock or vested stock options appear to prefer aggressive financial reporting. ACMs paid with stock-based compensation similar to unvested options or restricted stock appear to prefer overly conservative financial reporting. We find ACMs with fixed compensation have the lowest overall level of biased reporting.

Our study contributes to the literature in three ways. First, we provide empirical evidence that stock-based compensation influences ACM objectivity. This evidence should aid researchers in developing theories about ACM objectivity. Second, our evidence complements and extends contemporaneous archival evidence that finds an association between audit committee stock options and restatements (Archambeault et al. 2008). Our study goes further by showing that both current and future stock-based incentives can impact ACMs. Third, we build on Mayhew and Pike (2004) to show that incentives linked to current and future shareholders have differing effects on preferences for biased reporting. While Mayhew and Pike (2004) show that investor selection of auditors reduces the auditor's bias as compared to management selection, we show that preferences created by aligning interests with current investors are different from preferences when incentives align interests with future investors. Future archival research can explore whether similar differences are observable in field data.

Our research provides a starting point for further experimental research into the impact of ACM incentives on reporting. We believe a couple of paths deserve specific mention. Our setting could be expanded to examine group decisions about biased financial reporting. Also, we suppress board oversight of operating decisions that could be incorporated into a future experimental design, as well as consideration of monitoring under dual boards. Finally, future studies can examine the role of ACM reputation in mitigating the impact of stock-based compensation on biased financial reporting.

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Fundamentals-Based Risk Measurement in Valuation

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ABSTRACT: We propose a methodology to incorporate risk measures based on economic fundamentals directly into the valuation model. Fundamentals-based risk adjustment in the residual income valuation model is captured by the covariance of ROE with market-wide factors. We demonstrate a method of estimating covariance risk out of sample based on the accounting beta and betas of size and book-to-market factors in earnings. We show how the covariance risk estimate can be transformed to obtain the fundamentals-based cost of equity. Our empirical analysis shows that value estimates based on fundamental risk adjustment produce significantly smaller deviations from price relative to the CAPM or the Fama-French three-factor model. We further find that our single-factor risk measure, based on the accounting beta alone, captures aspects of risk that are indicated by the book-to-market factor, largely accounting for the "mispricing" of value and growth stocks. Our study highlights the usefulness of accounting numbers in pricing risk beyond their role as trackers of returns-based measures of risk.

Keywords: *covariance risk; accounting beta; cost of capital; value-growth anomaly.*

Data Availability: *All data are obtained from publicly available sources.*

I. INTRODUCTION

Measurement of risk is perhaps the single-most difficult task in valuing a security. Standard practice estimates risk from prior returns and obtains value by discounting expected future payoffs by the risk-adjusted cost of capital. While risk estimation using returns is simple to implement in practice, it is unclear what aspect of risk is

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captured by a non-primitive variable such as returns. If firm value is determined by more primitive or fundamental variables, then it seems logical that risk also arises from those primitives or fundamentals. In general, value is created by the operating, investing, and financing activities of a firm, and is directly linked with the earnings generating process. Hence, if the source of value generation and therefore the source of risk reside in economic fundamentals such as earnings, then it would make sense to measure risk directly from fundamentals.

As far back as the seventies, Beaver et al. (1970) investigated how returns-based measures of risk correlate with accounting measures of risk, such as the accounting beta, and earnings volatility. More recently, Fama and French (1995) examined whether size and book-to-market factors in returns reflect size and book-to-market factors in earnings. Underlying these inquiries is the notion that, if risk originates from fundamentals, a "good" measure of risk ought to be estimated from more primitive variables than returns. Yet, returns-based measures of risk are the practical norm, and their observed correlation with accounting risk measures is generally offered as evidence that the source of risk captured by these measures can be traced to economic fundamentals. Whether risk measures based on fundamentals can play a role in valuation beyond tracking returns-based risk measures remains largely unexplored. In this study, we propose a methodology that incorporates risk measures based on economic fundamentals *directly* into the valuation model. We ask the question: How does fundamentals-based risk adjustment affect valuation relative to the common practice of adjusting discount factors for risk estimated from returns using single- or multi-factor asset-pricing models?

We use the residual income valuation model to analytically derive a simplified risk adjustment that equals the covariance between a firm's return on book equity (ROE) and economy-wide risk factors.[1] We then identify accounting risk factors based on theory and empirical observation and use these factors to provide reasonable predictions of the risk adjustment term to obtain firm value. We compare how this value deviates from price relative to the value derived by discounting expected payoffs by a returns-based cost of equity.

We separately estimate two components of value: the risk-free present value and the covariance risk adjustment. For each firm, we first estimate the risk-free present value (*RFPV*), i.e., value without risk adjustment, using analysts' forecasts of future earnings, current book value of equity, and the risk-free rate as inputs to the residual income valuation model. We estimate the covariance risk adjustment for each firm out of sample by estimating factor loadings (or betas) of various risk factors and estimating factor risk premia. We use the accounting beta and betas of size and book-to-market factors *in earnings* as components of covariance risk.[2] We strive to adhere to the dictates of theory by using ROE *betas* rather than *ad hoc* measures such as the *magnitude* of size and book-to-market ratios, earnings volatility, or return volatility. However, since theory leaves the stochastic discount factor undefined, our choice of market-wide risk factors remains *ad hoc.*

Although we believe that illustrating how accounting risk measures map into firm value is a contribution in itself, from a practical standpoint it is important to determine if our risk adjustment is empirically valid. We compare valuation errors from our model with those from benchmark models that are also estimated using the residual income model with the same inputs, but where payoffs are discounted by a returns-based cost of equity. Our empirical findings show that the mean and median valuation errors (absolute deviation of value estimate from price) are significantly lower when firm value is estimated using fundamental risk based on firm-specific betas of three *earnings-based* factors (market, size, and book-to-market) as compared to that using the Fama-French three-factor model. In addition to firm-specific betas, we use betas averaged at the portfolio and industry levels to reduce noise due to the short time-series for estimation. Median valuation errors of the benchmark model are more than twice the magnitude of those that result from our model, when we use betas averaged at the portfolio and industry levels.[3]

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[1] The residual income valuation model expresses a firm's market value of equity as the book value of equity plus the present value of expected future residual income (Ohlson 1995; Feltham and Ohlson 1995). Residual income is income minus a charge for the use of capital measured by the beginning book value times the cost of capital.

[2] Analogous to the market beta, the accounting beta is the covariance of a firm's return on equity (ROE) with the market's ROE. Our use of size and book-to-market factors *in earnings* (based on differential ROEs of extreme portfolios) is consistent with Fama and French (1995).

We further find that median valuation errors with risk adjustment based on the accounting beta alone are very close in magnitude to those using three factors, for all levels of estimation. Median valuation errors of this single-factor model based on portfolio and industry level estimations are lower than those of the benchmark CAPM by about 34 percent. We find this to be noteworthy given that our beta estimations are based on a short time-series of annual data. The parsimonious nature of the single-factor model and the fact that the factor risk premium is derived from theory make this a desirable model and particularly useful in practical valuation.

We establish the empirical validity of our fundamental risk estimates by examining their association with *ex ante* firm characteristics that have either been suggested as proxies for firm-specific risk or are observed to be correlated with realized returns, namely market beta, leverage, information asymmetry, firm size, book-to-market ratio (B/M), and expected earnings growth (similar to Gebhardt et al. [2001] and Botosan and Plumlee [2005]). We find that our fundamental risk measure (one-factor and three-factor) and various risk proxies are consistently and significantly correlated in the predicted direction.

We further explore whether our fundamentals-based risk adjustment captures risk that is unexplained by measures based on the CAPM, such as the risk of value and growth stocks. Excess returns generated by strategies that buy value and short-growth stocks have been attributed to mispricing and/or to mismeasurement of CAPM risk. If value (high B/M) stocks are underpriced and growth (low B/M) stocks are overpriced, then this pattern should be evident from the difference between our value estimate and price. Using our one-factor (i.e., accounting beta) model, we find that the difference in the ratio of value to price of the extreme B/M portfolios is insignificant. We also estimate excess returns of extreme B/M portfolios where the expected return is measured as the fundamentals-based cost of equity derived from our covariance risk adjustment. We find that the difference in excess returns of the extreme B/M portfolios is insignificant and significantly lower than the difference based on CAPM risk adjustment. Overall, our fundamental risk measure captures a significant portion of the risk reflected in book-to-market ratios and to a large extent explains the "mispricing" of value and growth stocks.[4]

The conceptual antecedent of our price-level risk adjustment can be traced to the theoretical work by Rubinstein (1976). In turn, Baginski and Wahlen (2003) estimate risk implicit in stock price as the difference between *RFPV* and price. These authors find that this measure of priced risk is significantly associated with accounting risk measures (accounting beta and earnings volatility) and other risk proxies (size, B/M, and market beta). Our research goes beyond a within-sample explanation of priced risk. First, based on valuation theory, we develop a methodology to estimate fundamental risk *out of sample* and incorporate it directly into the valuation formula. Second, we establish the superiority of our out-of-sample covariance risk adjustment in terms of low valuation errors relative to returns-based risk adjustments. Third, we validate our covariance risk adjustment with known proxies for firm risk. Fourth, while the price-level fundamental risk adjustment is a necessary starting point in our analysis, we demonstrate how one can easily convert it to a return-level measure, the fundamentals-based cost of equity.

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[3] Note that for portfolio- and industry-level estimations, the risk-adjustment term is estimated for each firm with all *firm-level* variables except the betas.

[4] These results are consistent with the findings of Cohen et al. (2009). Based on a variance decomposition of the market-to-book ratio, these authors find that the mispricing component of the variance is insignificant when risk is measured as "cash flow" covariances (where cash flow is measured by the ROE).

We acknowledge that risk adjustment based on fundamentals may be more complex to implement than the returns-based cost of equity. However, we propose that the empirical validity of the one-factor (accounting beta) model and the fact that its estimation requires few additional inputs commend its use in practical valuation. In particular, our methodology can be applied to obtain value estimates of unlisted or newly listed companies for which returns-based risk measures cannot be estimated. Our measure of fundamentals-based cost of equity can be easily incorporated into any standard valuation formula used by analysts/ investors (e.g., the discounted cash flow model). Our results suggest that our risk measure would provide better risk assessment, leading to improved stock selection and portfolio management decisions.

In sum, this study contributes by incorporating accounting measures of risk directly into the valuation model both theoretically and practically. To our knowledge, this is the first study that explores the direct valuation role of accounting risk measures. Accounting risk measures are based on firm fundamentals that indicate the source of risk and hence the use of these measures as risk adjustments in valuation is appealing. While this study takes the first step in broadening the role of accounting risk measures in valuation, it opens up interesting possibilities for capturing the source of risk at an elemental level, for example, by disaggregating the ROE and measuring risk arising from profit margin, asset turnover, and leverage.[5]

Section II presents the theoretical development of the covariance risk adjustment. Section III describes the data, sample selection, and research design. Section IV reports empirical results and discusses practical applications of our risk adjustment. Concluding remarks follow in Section V.

II. THEORETICAL DEVELOPMENT

Covariance Risk Adjustment

In this section, we derive a simplified covariance risk adjustment in the residual income valuation model. The residual income model expresses value as the current book value of the firm plus the present value of expected future residual income, where residual income (or abnormal earnings) equals earnings in excess of a normal return on beginning-of-period book value. Assuming the clean surplus relation (i.e., the change in book value equals earnings minus dividends), the residual income model is equivalent to the dividend discount model (Ohlson 1995; Feltham and Ohlson 1995). Besides the important fact that risk adjustment using fundamentals emerges theoretically in the residual income model, the model has some advantages over the dividend discount model and the discounted cash flow model (DCF) in terms of covariance risk estimation. Covariance of dividends as payoffs is unlikely to provide a good measure of risk because dividend policies tend to be arbitrary and do not vary much over time. Covariance based on earnings rather than free cash flows is likely to provide a better indication of risk since earnings capture economic performance better over short horizons (see discussions by Penman and Sougiannis [1998] and Dechow and Schrand [2004]).[6]

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[5] Based on insights from the discussion in Penman (2003, Chapter 18) about how the drivers of ROE determine fundamental risk, we plan to incorporate the components of ROE risk in our future analysis (see Nekrasov 2008). The current study is perhaps the first response to Penman's call for a shift in focus from returns-based risk to fundamental risk estimation.

We begin with a general representation of the dividend discount formula:

$$V_t = E_t \sum_{j=1}^{\infty} \tilde{m}_{t,t+j} \tilde{d}_{t+j} \tag{1}$$

where V_t = value of equity at date t, d_t = dividends at date t, $\tilde{m}_{t,t+j}$ equals the j-period stochastic discount factor, and $1/E_t[\tilde{m}_{t,t+j}] = R^f_{t,t+j} = (1 + r^f_{t,t+j})$ equals 1 plus the risk-free return from date t to $t+j$.[7] Assuming the clean surplus relation, $B_t = B_{t-1} + x_t - d_t$, where B_t = book value of equity at date t, x_t = earnings for period t, and defining residual income (or abnormal earnings) as $x^a_{t+j} = x_{t+j} - r^f_{t+j-1,t+j}B_{t+j-1}$, we can express the residual income valuation model as:

$$V_t = B_t + E_t \sum_{j=1}^{\infty} \tilde{m}_{t,t+j} \tilde{x}^a_{t+j}. \tag{2}$$

Separating the expected residual earnings component and the risk component and substituting $E_t[\tilde{m}_{t,t+j}] = 1/R^f_{t,t+j}$, we obtain:

$$V_t = \left(B_t + \sum_{j=1}^{\infty} \frac{E_t[\tilde{x}^a_{t+j}]}{R^f_{t,t+j}}\right) + \left(\sum_{j=1}^{\infty} Cov_t[\tilde{m}_{t,t+j}, \tilde{x}^a_{t+j}]\right) \equiv RFPV + Risk\ Adjustment \tag{3}$$

where *RFPV* or the "risk-free present value" is assumed to converge. *RFPV* equals current book value of equity plus the present value of expected future residual earnings discounted at the risk-free rate. *Risk Adjustment* in Equation (3) is a negative number and, in contrast with standard practice, modifies expected payoffs in the numerators rather than modifying discount factors in the denominators of the valuation model.[8,9] To simplify the model, we assume a flat and nonstochastic risk-free rate and express *RFPV* as a finite period calculation with a terminal value at horizon $t+T$:

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[6] Although a number of theoretical studies (e.g., Lambert et al. 2007) define risk as the covariance of free cash flows with the market-wide factor, to *empirically* capture risk based on finite horizon information, studies like Cohen et al. (2009) use earnings instead of cash flows in their analysis.

[7] $m_{t,t+j}$ is a set of contingent claims prices scaled by state probabilities, also referred to as state-price density. In a two-date economy with no arbitrage, the value of an asset can be expressed as $V = \Sigma_s d_s R_s = \Sigma_s d_s m_s \pi_s = E[\tilde{m}\tilde{d}] = E[\tilde{m}]E[\tilde{d}] + Cov[\tilde{m},\tilde{d}]$, where R_s is the implicit price of a claim to one unit of dividends in state s, π_s is the objective (true) probability of state s, and $m_s = R_s/\pi_s$ (see Cochrane 2001).

$$RFPV_t = B_t + \sum_{j=1}^{T-1} \frac{FEROE_{t+j}E_t[\tilde{B}_{t+j-1}]}{(1 + r^f)^j} + \frac{FEROE_{t+T}E_t[\tilde{B}_{t+T-1}]}{(1 + r^f)^{T-1}(r^f - g)} \tag{4}$$

where $FEROE_{t+j} = E_t[\tilde{x}_{t+j}]/E_t[\tilde{B}_{t+j-1}] - r^f$ = forecasted excess return on equity (forecasted *EROE*), $(1 + r^f)^j = R^f_{t,t+j}$ (all j), and g = long-run rate of growth in residual earnings. The third term on the RHS represents the terminal value, which assumes that residual earnings at $t+T$ will grow at the rate g to perpetuity.

Implementation of the risk adjustment in Equation (3) poses a difficulty. Equation (3) requires us to estimate an infinite set of covariances, which is not feasible. Our objective in the analysis that follows is to simplify the risk-adjustment term such that we can make reasonable estimates of the covariance term with available data. We express the infinite set of covariances as a single (constant) covariance of excess ROE with market-wide factors that can be estimated from historical data. Expressing residual earnings in the form of a rate of return, as excess ROE, allows us to make the assumption of constant covariance, which is a less reasonable assumption for the nonstationary earnings series.

Appendix A derives a simplification of the risk-adjustment term in Equation (3) as:

$$Risk\ Adjustment_t \approx \sum_{j=0}^{\infty} \frac{E_t[B_{t+j}]}{(1 + r^f)^j}\, Cov[m, EROE]. \tag{5}$$

This derivation assumes that the covariance between excess ROE and the stochastic discount factor is constant across time, consistent with constant betas over time as is generally assumed in standard estimations of the CAPM. The expression for risk adjustment in Equation (5) is a result of further simplification achieved by omitting a complex term whose relative effect is negligible under alternative assumptions about excess ROE dynamics (see Appendix A). Assuming the same terminal value growth rate as in Equation (4), we obtain:

$$Risk\ Adjustment \approx K_t Cov[EROE, m] \tag{6}$$

where $K_t = \left[\sum_{j=0}^{T-1} \frac{E_t(B_{t+j})}{(1 + r^f)^j} + \frac{E_t(B_{t+T})}{(1 + r^f)^{T-1}(r^f - g)}\right]$. Assuming a linear factor model, $m = a - \sum_l \lambda_l f_l$, where f_l = an economy-wide risk factor, we can re-write Equation (3) as:

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[8] Assuming convergence, Equation (3) is equivalent to the residual income valuation function in Feltham and Ohlson (1999), although our notation is slightly different. These authors express the valuation function as $V_t = B_t + \Sigma_{j=1}^{\infty} (R^f_{t,t+j})^{-1}(E_t[\tilde{x}^a_{t+j}] + Cov_t[\tilde{x}^a_{t+j}, \tilde{Q}_{t,t+j}])$ where $\tilde{Q}_{t,t+j}$ = risk-adjustment index = $\tilde{m}_{t,t+j}R^f_{t,t+j}$.

[9] The stochastic discount factor in consumption-based models is the marginal rate of substitution, $\tilde{m}_{t,t+j} = \beta u'(\tilde{c}_{t+j})/u'(c_t)$, where β is the subjective discount factor, c_t is consumption at date t, and $u(c)$ denotes an investor's utility function. Thus, $m^s_{t,t+j}$ is the rate at which an investor is willing to substitute consumption at date $t+j$, state s, for consumption at date t. Since the utility function $u(c)$ is concave for risk-averse investors, the marginal utility $u'(\tilde{c}_{t+j})$ and the stochastic discount factor, $\tilde{m}_{t,t+j}$, are decreasing in future consumption, $\tilde{c}_{t+j}$. This implies that the marginal value of a unit payoff is high (low) when aggregate consumption is low (high). Thus, a higher covariance of payoff with consumption results in a lower asset value.

$$(RFPV_t - V_t) = -Risk\ Adjustment = K_t \sum_l \lambda_l Cov[EROE, f_l] \tag{7}$$

Thus, while the general model requires covariance risk adjustment to every future payoff term in the formula, Equation (7) reduces the risk adjustment to a single term that can be easily estimated as a weighted sum of covariances of excess ROE with economy-wide risk factors.

Relation between Price-Level Risk Measure and Cost of Equity

The risk adjustment in Equation (7) is an aggregate price-level measure rather than a return-level measure. The standard asset-pricing framework (e.g., CAPM or Arbitrage Pricing Theory) derives the cost of equity by using factor betas and factor premia estimated from returns. There is no theoretical analog for the standard asset-pricing model in which the cost of equity is derived by using accounting variables (or fundamentals) to estimate betas and premia. Although we cannot directly incorporate accounting-based betas in the standard cost of equity formula, we can accommodate fundamental variables in the covariance risk adjustment at the price level as shown in Equation (7). Further, we can covert the covariance risk adjustment (a price-level measure) to a fundamentals-based risk-adjusted cost of equity (a return-level measure); however, this equivalence arises only as a special case. Under the assumption that expected residual earnings grow at a constant rate g after period $t+1$, and scaling Equation (7) by P_t, we obtain:

$$K_t \sum_l \lambda_l Cov[EROE, f_l]/P_t = \text{Covariance Risk}/P_t = (E(r) - r^f)/(r^f - g). \tag{8}$$

Equation (8) is intuitive, as the (price-scaled) covariance risk is expressed as the capitalized value of the firm's risk premium. Expressing Equation (8) in terms of the cost of equity, i.e., $E(r)$, we obtain:

$$E(r) = r^f + (r^f - g)[\text{Covariance Risk}/P_t]. \tag{9}$$

Thus, the firm's cost of equity, $E(r)$, equals the risk-free rate plus the (price-scaled) covariance risk times the capitalization factor, $(r^f - g)$.[10] In the next section, we define variables used in the empirical analysis and describe the covariance risk-estimation procedure.

III. DATA AND RESEARCH DESIGN

Our sample includes firms with required data on Compustat, CRSP, and I/B/E/S databases. We include only firms with a December fiscal year-end.[11] To estimate earnings-based betas, a firm is required to have data on annual earnings (before extraordinary items) and beginning-of-year book value for at least ten consecutive years prior to the valuation year. We use the residual income model to obtain value estimates for each firm at the end of April of each year of our sample period, 1982–2005. To obtain firm value estimates, we use the per share beginning-of-year book value, analysts' EPS forecasts for the subsequent five years, and the yield on ten-year U.S. government bonds as the risk-free rate.[12] We use the I/B/E/S mean consensus analysts' EPS forecasts in the month of April for one and two years ahead and apply the forecasted long-term growth rate to the two-year-ahead forecast to obtain forecasts for years three to five. We eliminate firms with negative two-year-ahead forecasts because growth from a negative base is not meaningful. To mitigate problems due to small denominators and outliers, we also delete firms with beginning-of-year book value and end-of-April price less than or equal to ten cents, and with end-of-April book-to-market ratios less than 0.01 and greater than 100. Our final sample ranges from 415 firms in 1982 to 1,132 firms in 2005.

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[10] Analogously, one can show that the price-level market premium equals the capitalized value of the return-level market premium, that is, $(RFPV_M - P_M)/P_M = E(r^M - r^f)/(r^f - g)$, where g is the constant growth rate of expected residual earnings after period $t+1$.

[11] Similar to other valuation studies, we exclude non-December fiscal year-end firms so that (1) betas as well as priced risk are estimated at the same point in time for each firm-year observation, and (2) portfolios can be formed on the basis of characteristics that are measured at the same point in time for all firms.

Next we explain how we separately estimate the two components of firm value: (1) *RFPV* as the current book value plus the present value of expected future residual earnings discounted at the risk-free rate, and (2) the risk-adjustment term in Equation (7).

Estimation of *RFPV*

To estimate *RFPV* from Equation (4), we make assumptions that are standard in the literature on earnings-based valuation (e.g., Frankel and Lee 1998; Claus and Thomas 2001; Gebhardt et al. 2001; Easton et al. 2002; Baginski and Wahlen 2003). Book value per share for subsequent years is forecasted using the clean surplus relation, i.e., $B_t = B_{t-1} +$ forecasted $\text{EPS}_t -$ forecasted dividend per share_t. Dividend per share is forecasted by assuming a constant expected payout that equals the current payout ratio. For firms experiencing negative current earnings, we obtain an estimate of the payout ratio by dividing current dividends by 6 percent of total assets (a proxy for normal earnings based on the historical long-run return on assets for U.S. companies).

Growth-Rate Assumptions

We use several terminal growth-rate assumptions to estimate the terminal value in the *RFPV* calculation, including zero growth, a 3 percent growth rate that approximates the long-run inflation rate, and a "fade" rate that assumes that a firm's ROE reverts (linearly) to the median industry ROE at date $t+12$ and residual income remains constant thereafter (see Gebhardt et al. 2001). For *RFPV* to converge, the assumed terminal growth rate must be less than r^f. This is not a concern when we assume zero terminal growth or use the fade rate to forecast future ROE up to date $t+12$ and assume zero terminal growth thereafter. The convergence of *RFPV* could be a concern when we assume a 3 percent terminal growth rate, but we find that r^f is greater than 3 percent in all years of our sample period.[13] The same growth-rate assumption is applied to estimate value using benchmark models (for example, the model using CAPM risk-adjusted cost of equity to discount expected future residual earnings).

Estimation of Covariance Risk (Out-of-Sample)

To estimate covariance risk, we use Equation (7) to calculate "priced risk" as $(RFPV_t - P_t)$ scaled by P_t:

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[12] Yields on ten-year U.S. government bonds are obtained from Federal Reserve Bulletins (Table 1.35) for the month of April of each year.

[13] In three years of the latest subperiod of the 24-year sample period, r^f is quite low, ranging from 4 percent to 5 percent. This results in a small denominator in the terminal value calculation, which may unduly influence our value estimates. To ensure that our results are not affected by the small denominator problem, we winsorize $(r^f - g)$ at 2 percent in these three years. Our results are not sensitive to the winsorization.

$$\frac{(RFPV_t - P_t)}{P_t} = \sum_l \lambda_l \frac{K_t Cov[EROE, f_l]}{P_t} \tag{10}$$

and separately estimate the two components of the risk-adjustment term: factor sensitivity, $K_t Cov[EROE, f_l]/P_t$, and factor premium, λ_l. Note that factor sensitivity is a firm-specific measure that equals the sum of discounted future book values of the firm (K_t) times the covariance of excess ROE with the specific market factor, f_l, scaled by P_t. The factor premium, λ_l, is a market-wide measure.

Estimation of Factor Sensitivities (Betas) and Factor Risk Premia

To estimate $Cov[EROE, f_l]$, we use three fundamentals-based risk measures, namely, the accounting beta, beta of the size factor *in earnings*, and beta of the book-to-market factor *in earnings*. We estimate the accounting beta as the slope coefficient from a regression of a firm's excess ROE on the market's excess ROE. Thus, the accounting beta measures nondiversifiable risk as the co-movement of a firm's ROE with that of the market, which is analogous to the market beta using a firm's accounting rate of return instead of its market return. Fama and French (1992) argue that, if stocks are priced rationally, higher returns to small firms and high book-to-market stocks arise because these variables proxy for unnamed risk factors in expected returns.[14] Fama and French (1995) show that common factors in returns (market, size, and book-to-market) mirror common factors in earnings and that the market and size factors in earnings help explain those in returns. Thus, similar to returns-based risk factors, we use the return on *book* equity for the market, and size and book-to-market factors in *earnings* as (accounting) risk factors.

For each firm, we estimate betas or the sensitivity of a firm's excess ROE to (1) the market's excess ROE (*MKT.EROE*), (2) ROE of the SMB (small minus big) portfolio (*SMB.ROE*), and (3) ROE of the HML (high minus low book-to-market) portfolio (*HML.ROE*). Analogous to the Fama-French factors in returns, the SMB (HML) factor *in earnings* is the ROE of a portfolio of small (high book-to-market) firms minus the ROE of a portfolio of large (low book-to-market) firms. The extreme portfolios comprise the top and bottom 30 percent of observations. For each firm i, betas are estimated from the following regressions using the time-series over at least ten years and up to 20 years preceding the valuation year t ($\tau = t-21,\ldots,t-1$):

$$EROE_\tau = \alpha + \beta_{ACCT} MKT.EROE_\tau + \varepsilon_\tau \tag{11}$$

$$EROE_\tau = \alpha' + \beta_{ESMB} SMB.ROE_\tau + \varepsilon'_\tau \tag{12}$$

$$EROE_\tau = \alpha'' + \beta_{EHML} HML.ROE_\tau + \varepsilon''_\tau, \tag{13}$$

where β_{ACCT} is the accounting beta, β_{ESMB} is the beta of the size factor in earnings, and β_{EHML} is the beta of the book-to-market factor in earnings.[15]

To estimate factor premia, we run the cross-sectional regression based on Equation (10) using data from year $t-1$ relative to the valuation year t:

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[14] Chan and Chen (1991) postulate that the risk captured by book-to-market ratios is a relative distress factor, because firms that the market judges to have poor prospects, as signaled by their low prices and high B/M ratios, have higher expected returns (they are penalized with higher costs of capital) than firms with strong prospects.

[15] We estimate betas by winsorizing excess ROE at ±0.50; results are insensitive to alternative winsorization.

$$\frac{(RFPV_{t-1} - P_{t-1})}{P_{t-1}} = c_1 Cov_{ACCT} + c_2 Cov_{ESMB} + c_3 Cov_{EHML} + v_{t-1}, \quad (14)$$

where $Cov_{ACCT} = K_{t-1}\hat{\beta}_{ACCT}/P_{t-1}$, $Cov_{ESMB} = K_{t-1}\hat{\beta}_{ESMB}/P_{t-1}$, $Cov_{EHML} = K_{t-1}\hat{\beta}_{EHML}/P_{t-1}$, c_1, c_2, and c_3 are the estimated factor risk premia, and v_{t-1} is the error term. $\hat{\beta}_{ACCT}$, $\hat{\beta}_{ESMB}$, and $\hat{\beta}_{EHML}$ are the slope coefficients estimated from Regressions (11), (12), and (13) for each firm. Note that the independent variables reflect the sum of covariances of *residual earnings* with the respective market factor scaled by P_{t-1}; however, to estimate the independent variables, we break down residual earnings into two components, excess ROE and book value, to obtain more reliable estimates of covariances.[16] Note further that our risk measures are based on covariances of *excess ROE* as suggested by theory; however, our choice of the covariates or market-wide factors remains *ad hoc*.[17]

We obtain the predicted value of $(RFPV_t - V_t)/V_t$ by first multiplying the estimated coefficients from Regression (14), $\hat{c}_1$, $\hat{c}_2$, and $\hat{c}_3$, by the respective covariances from the previous year, Cov_{ACCT}, Cov_{ESMB}, and Cov_{EHML}, and then taking the sum of these products (i.e., we take the fitted value of Regression (14)). Using this estimate of risk adjustment and our estimate of *RFPV*, we obtain the estimate of firm value, *V*.

Our use of the three earnings-based risk factors (market, size, and book-to-market) to estimate firm value is supported by our finding that these factors have significant explanatory power for priced risk in the cross-section (see Appendix B and Table A1). In the interest of parsimony, we also estimate firm value using only one risk factor, the market's excess ROE. An additional advantage of this risk measurement is that the factor premium can be derived from theory. For the market portfolio, as $\hat{\beta}_{ACCT} = 1$, the factor premium equals $(RFPV_{Mt} - P_{Mt})/K_{Mt}$, or the market's priced risk scaled by the aggregate (capitalized) book value of the market portfolio—an accounting analog of market risk premium. Thus, the risk-adjustment term equals $[(RFPV_{Mt-1} - P_{Mt-1})/K_{Mt-1}]Cov_{ACCT}$ for the one-factor model, where Cov_{ACCT} is estimated for each firm *i* in the previous year $t-1$.

Portfolio- and Industry-Level Estimation

Since the estimation of firm-specific betas is noisy due to the relatively small number of observations in the estimation period (at least ten and up to 20 annual observations), we also estimate betas at the portfolio and industry levels.[18] We construct 25 size-B/M portfolios of sample firms by first forming quintiles of firm size and then, within each size quintile, forming five portfolios based on the book-to-market ratio (B/M). Firm size equals market value of equity at the end of April of each year. B/M is measured as book value of equity at the end of the previous year (i.e., December 31) divided by market value of equity at the end of April of each year. We estimate portfolio betas as the portfolio means of firm-specific betas ($\hat{\beta}_{ACCT}$, $\hat{\beta}_{ESMB}$, and $\hat{\beta}_{EHML}$), and obtain factor premia by estimating Regression (14) for the previous year $t-1$ relative to the valuation year t. Regression (14) is estimated with firm-level (not portfolio-level) observations, with portfolio betas replacing firm-specific betas in constructing the independent variables. For estimation of industry betas and factor premia, we form industry groups based on the Fama-French 48-industry classification (Fama and French 1997) and follow the same estimation procedure as used for size-B/M portfolios.

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[16] Technically, the independent variables are covariances of residual earnings with the respective market factor divided by the variance of the market factor, which is a cross-sectional constant and hence is inconsequential in explaining the dependent variable. In estimating Regression (14), we replace V_{t-1} in Equation (7) by P_{t-1}, because V_{t-1} is unobservable.

[17] In consumption-based models, a higher covariance of payoff with consumption results in higher risk and lower asset values. Since our measure of payoff is excess ROE, we use the market's excess return on equity to capture change in aggregate consumption. Interestingly, we find that the correlation between the *market's excess ROE* and per capita consumption growth over the period 1963–2004 is 0.33 in contrast with a low correlation of 0.08 between the excess *market return* and consumption growth.

[18] For out-of-sample estimation, firm-specific accounting betas are winsorized at 0 and +3 and size and book-to-market betas at ±3. Results are substantially similar when we winsorize accounting betas at 0 and +5 and size and book-to-market betas at ±5.

Estimation of Benchmark Models

We estimate firm value from different benchmark models using the same data within the forecasting horizon, the same risk-free rate, and the same terminal growth-rate assumption that we use to obtain our estimate of firm value. The benchmark models are also based on the residual income valuation formula, but these models incorporate risk in the cost of equity used to discount expected future residual earnings. The risk-adjusted cost of equity is estimated using the CAPM, and the Fama-French three-factor model. For estimation of the CAPM cost of equity, we estimate betas using monthly security returns and returns of the CRSP (NYSE-AMEX-NASDAQ) value-weighted market index over a period of 60 months ending in April of the valuation year (minimum of 40 months). Expected market risk premium is measured as the arithmetic average of value-weighted market returns minus the risk-free rate from 1926 until the end of April of the valuation year. For estimation of the cost of equity using the Fama and French (1993) three-factor model, we estimate betas using excess returns of the market, the SMB, and the HML portfolios over a period of 60 months ending in April of the valuation year and calculate the expectations of the three factor premia using the arithmetic averages from 1926 until April of the valuation year.[19]

We compare our model based on firm-specific, industry, and portfolio risk adjustments with benchmark models using firm-specific, industry-, and portfolio-level cost of equity, respectively. *Ex ante*, it is unclear whether the fundamental risk measure would capture risk better than the CAPM or the Fama-French three-factor model. First, as argued by Campbell and Vuolteenaho (2004), returns are derived from primitives, namely cash flows/earnings and discount rates, and the aggregation of these primitives into returns may lose information related to risk. Second, returns-based risk measures estimate betas using high frequency data from the market. If markets are even slightly inefficient, mispricing could contaminate not only average returns, but also measures of risk, as argued by Brainard et al. (1991) and Cohen et al. (2009). In view of these differences in returns-based versus earnings-based risk factors, whether the fundamental risk adjustment captures risk better than the benchmark CAPM and Fama-French three-factor model is an empirical question that we address.

Empirical Validation of Fundamental Risk Measures

We validate our risk measures using different approaches. First, we emphasize the price-level criterion to evaluate our risk estimation method by comparing value estimates with the observed price. Cohen et al. (2009) argue that asset-pricing models should be evaluated by the closeness of value estimates derived from the model to the current stock price. This price-level criterion is appropriate in the context of long-term investment decisions and in tests of market efficiency. Similar to Penman and Sougiannis (1998), we compare valuation errors, measured as value estimate minus current price, of models with fundamental risk adjustment to those obtained from benchmark models.

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[19] Monthly data of the three factors is obtained from Kenneth French's website, for which we are grateful. Our use of the average factor risk premia from 1926 up to the valuation date assumes insignificant variation in factor premia over time. In case this assumption is not true (as suggested by Fama and French [1997]), we also estimate the benchmark models with factor premia averaged over rolling windows of 30, 20, 10, and 5 prior years. We find that shorter rolling windows in fact produce larger valuation errors for both the CAPM and the Fama-French models (untabulated).

Second, in addition to assessing the point accuracy of the average value estimate, we examine the cross-sectional relation between the fundamentals-based covariance risk estimates and the cost of equity *implied* by the current price. The implied cost of equity is estimated by inverting the residual income model using the observed price and the same inputs as used in the calculation of *RFPV*. In this approach, we validate our risk estimation method by comparing the correlation of the implied cost of equity with fundamentals-based risk estimates and with the benchmark CAPM and Fama-French cost of equity. However, we prefer the price-level criterion as a validation approach, because price is an observed variable, whereas the implied cost of equity is an estimated value that may be subject to noise and bias.[20]

Third, Botosan and Plumlee (2005) evaluate the reliability of alternative estimates of the implied cost of equity (or risk premium) by examining their association with known proxies for firm-specific risk, namely market beta, leverage, information asymmetry, firm size, and growth.[21] Similarly, we test whether the association between our covariance risk measure (or the equivalent fundamentals-based cost of equity) and various risk proxies is significant and in the predicted direction.[22]

IV. EMPIRICAL RESULTS

Table 1 reports descriptive statistics of our sample firms over three subperiods: 1982–89, 1990–97, and 1998–2005. In Panel A, we present means and medians of variables that we use as inputs to the residual income valuation model. The mean and median price per share increase over the three subperiods, while the mean and median book value per share remain more or less stable. The mean (median) book-to-market ratio declines from a high of 0.75 (0.71) in 1982–89 to 0.52 (0.45) in 1998–2005, reflecting the effect of the bull market over this time period. The mean (median) dividend payout ratio declines steadily from 45 percent (41 percent) in the earliest subperiod to 29 percent (24 percent) in the latest subperiod. Analysts' expectations of ROE for the subsequent one and two years trend slightly upward compared to the reported ROE; this upward trend is discernible in all subperiods. The risk-free rate (ten-year government bond rate) declines significantly over our sample period from a mean of 10 percent in 1982–89 to a mean of 5 percent in 1998–2005. A similar declining trend is visible in the cost of equity estimates based on the CAPM and the Fama-French three-factor model.

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[20] We examine cross-sectional correlations rather than deviations of risk estimates from implied cost of equity because the latter method can lead to inference problems due to biases in the implied cost of equity and the risk estimates from different models.

[21] Gebhardt et al. (2001) also examine the association of their measure of implied risk premium with risk proxies that capture market volatility, leverage, liquidity and information environment, and earnings variability.

[22] An asset-pricing model can also be evaluated by examining how well the expected returns estimated from the model map into realized future returns—typically returns of the next year. Similar to Vuolteenaho (2002), Easton and Monahan (2005) note that realized returns are noisy measures of expected returns because they incorporate "information surprises." Consistent with this argument, they find weak empirical correlation between expected and realized future returns. Due to this concern, we do not use the realized future returns criterion to evaluate the overall validity of our fundamental risk measure. Note that model evaluation using the realized-return criterion could be inconsistent with that based on valuation errors due to noise in realized returns and differences in investing horizons of the two approaches (one future year versus infinite).

TABLE 1
Descriptive Statistics of Sample Firms over Three Subperiods: 1982–1989, 1990–1997, and 1998–2005

Panel A: Model Inputs

	1982–1989		1990–1997		1998–2005	
Variables	**Mean**	**Median**	**Mean**	**Median**	**Mean**	**Median**
Price	20.55	15.19	22.87	18.56	30.82	25.81
Book Value Per Share	14.41	10.43	12.02	9.50	13.43	10.91
Book-to-Market Ratio	0.75	0.71	0.57	0.54	0.52	0.45
Dividend Payout	44.70%	40.55%	39.77%	37.04%	28.96%	24.00%
ROE	13.40%	14.24%	13.50%	13.50%	13.21%	13.63%
FROE One-Year-Ahead	15.99%	15.03%	16.52%	14.38%	16.43%	14.54%
FROE Two-Years-Ahead	17.17%	15.74%	17.30%	15.34%	17.02%	15.19%
Long-Term Growth Rate	11.69%	11.50%	11.69%	11.00%	13.32%	12.00%
Risk-Free Rate	9.92%	9.18%	7.13%	6.97%	4.90%	5.14%
Cost of Equity (CAPM)	15.87%	15.73%	13.35%	13.40%	11.88%	11.55%
Cost of Equity (Fama-French)	18.13%	17.68%	15.70%	14.95%	15.83%	15.45%

Panel B: Model Outputs

	1982–1989		1990–1997		1998–2005	
Variables	**Mean**	**Median**	**Mean**	**Median**	**Mean**	**Median**
Priced Risk	13.10	7.11	22.77	15.70	49.22	38.31
Risk-Free Present Value (*RFPV*)	33.65	23.55	45.64	35.28	80.04	66.18
Priced Risk/Price	0.63	0.50	1.05	0.89	1.81	1.56
Implied Cost of Equity	12.69%	12.13%	10.56%	10.22%	9.20%	8.75%
No. of Observations	4,664	4,664	6,093	6,093	7,238	7,238

Panel C: Out-of-Sample Estimates

	1982–1989		1990–1997		1998–2005	
Variables	**Mean**	**Median**	**Mean**	**Median**	**Mean**	**Median**
Covariance Risk (one-factor)/Price	0.58	0.49	0.84	0.75	1.28	1.17
Covariance Risk (three-factor)/Price	0.43	0.34	0.63	0.50	1.06	0.87
Expected Return (one-factor)	13.08%	12.50%	10.51%	10.26%	8.77%	8.52%
Expected Return (three-factor)	12.16%	11.53%	9.66%	9.31%	8.11%	7.56%
No. of Observations	3,625	3,625	5,554	5,554	6,337	6,337

Means and medians of variables are calculated for firm-years over each subperiod. Book value is the book value of common equity at the beginning of the year. Price is the price per share at the end of April of each year. Dividend payout equals the annual dividend per share divided by actual earnings per share (both from I/B/E/S). ROE is the return on equity calculated as EPS (before extraordinary items) divided by beginning-of-year book value per share. FROE one-year-ahead (two-year-ahead) is the I/B/E/S consensus analysts' one-year- (two-years-) ahead EPS forecast in the month of April of each year divided by forecasted beginning-of-year book value per share. Forecasted book value per share is derived from the clean surplus relation. Long-term growth rate is the median I/B/E/S estimate of long-term growth in EPS. Risk-Free Rate is the yield on ten-year U.S. Government bonds. Cost of Equity (CAPM) is estimated using CAPM. Cost of Equity (Fama-French) is estimated using the Fama and French (1993) three-factor model. Risk-Free Present Value (*RFPV*) is derived from the residual income model using current book value, forecasted ROEs, forecasted book values, and the risk-free rate as laid out in Equation (4). Priced Risk is the discount for risk implicit in price and is estimated

(*continued on next page*)

TABLE 1 (continued)

by subtracting the security price from the risk-free value (*RFPV* − *P*). Implied Cost of Equity is estimated by inverting the residual income model with the same inputs as used in the calculation of *RFPV*. Covariance Risk (one-factor) is the firm-specific out-of-sample estimate of covariance risk using the earnings-based market factor (accounting beta). Covariance Risk (three-factor) is the firm-specific out-of-sample estimate of covariance risk based on three earnings-based factors: market, size, and book-to-market. Expected Returns (one-factor and three-factor) are derived from the firm-specific covariance risk estimates using Equation (9).

Panel B of Table 1 presents the mean and median estimates of the risk-free present value (*RFPV*), priced risk, and implied cost of equity. Although we use alternative terminal growth-rate assumptions to estimate *RFPV*, we only report results based on a 3 percent rate. Given that we are primarily interested in *relative* valuations, our conclusions are generally insensitive to the growth-rate assumption. From Panel B, *RFPV* increases steadily over time. The increasing trend in *RFPV* is consistent with declining risk-free rates over this time period. The mean Priced Risk/Price increases over the three subperiods, while the mean implied cost of equity declines over the three subperiods.[23] Overall, the implied cost of equity is in line with values reported by prior studies—for example, Claus and Thomas (2001)—report mean implied cost of equity of 12.4 percent over 1985–89 and 10.3 percent over 1990–98.

In Panel C of Table 1, we report means and medians of our fundamental risk adjustment (i.e., covariance risk) and expected return (i.e., fundamentals-based cost of equity) estimated out of sample. The sample size declines due to additional data requirements for the out-of-sample estimation and the exclusion of 1982, the first year of the sample period. Consistent with the within-sample estimates of Priced Risk/Price, the out-of-sample estimates of Covariance Risk/Price steadily increase over the three subperiods for both the one-factor and three-factor models. On the other hand, consistent with the within-sample estimates of implied cost of equity, the out-of-sample estimates of expected return (based on Equation (9)) decline over the three subperiods. The opposite trends in Covariance Risk/Price and expected return mirror the within-sample trends in Priced Risk/Price and implied cost of equity reported in Panel B.

Comparison of Valuation Errors

In Table 2, we report valuation errors of the residual income model with fundamental risk adjustment and compare them with errors of benchmark models (residual income model with risk-adjusted cost of equity using CAPM or the Fama-French three factors). Errors from the one-factor model (based on accounting beta) and the CAPM are reported in Panel A, and those from the three-factor model (based on accounting beta, and earnings-based size and book-to-market betas) and the Fama-French model are reported in Panel B. We report (1) percentage absolute errors measured as the absolute difference between the value estimate (V) and price (P), divided by price,[24] and (2) rank errors measured as the absolute difference between the rank of V (V_R) and the rank of P (P_R), where V_R and P_R are obtained each year by ranking V and P separately and dividing the rank by the number of sample firms in that year (thus obtaining a variable that ranges from 0 to 1). We report rank errors because they are less susceptible to outliers and biases. Both panels report valuation

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[23] These trends are similar to those reported in Baginski and Wahlen (2003). The decline in implied cost of equity is not inconsistent with the increase in Priced Risk/Price, since Priced Risk/Price = $(E(r) - r^f)/(r^f - g)$, and r^f is decreasing over time.

[24] To mitigate the effect of outliers on our results, we winsorize percentage absolute errors at 100 percent.

TABLE 2
Comparison of Valuation Errors of Model with Fundamental Risk Adjustment with Those of Benchmark Models

Panel A: Deviations of Estimated Value from Price (Valuation Errors) of One-Factor Models

	% Lower	Fundamental Risk		CAPM		t-test	Med. Test
	Error (1)	Mean (2)	Median (3)	Mean (4)	Median (5)	(p-values)	(p-values)
%Absolute Errors							
Firm-specific	50.3%	41.25%	32.76%	38.32%	35.91%	(0.9999)	(< 0.0001)
Portfolio-level	63.1%*	26.32%	20.51%	31.59%	30.94%	(< 0.0001)	(< 0.0001)
Industry-level	63.9%*	27.69%	21.52%	34.09%	32.93%	(< 0.0001)	(< 0.0001)
Rank Errors							
Firm-specific		0.156	0.109	0.145	0.111	(0.9999)	(0.1349)
Portfolio-level		0.095	0.066	0.107	0.076	(< 0.0001)	(< 0.0001)
Industry-level		0.102	0.070	0.125	0.099	(< 0.0001)	(< 0.0001)

Panel B: Deviations of Estimated Value From Price (Valuation Errors) of Three-Factor Models

	% Lower	Fundamental Risk		Fama-French		t-test	Med. Test
	Error (1)	Mean (2)	Median (3)	Mean (4)	Median (5)	(p-values)	(p-values)
%Absolute Errors							
Firm-specific	56.6%*	45.36%	36.71%	48.50%	49.89%	(< 0.0001)	(< 0.0001)
Portfolio-level	83.0%*	26.47%	19.99%	48.69%	50.00%	(< 0.0001)	(< 0.0001)
Industry-level	77.2%*	29.22%	21.36%	48.02%	50.36%	(< 0.0001)	(< 0.0001)
Rank Errors							
Firm-specific		0.120	0.080	0.159	0.118	(< 0.0001)	(< 0.0001)
Portfolio-level		0.092	0.064	0.092	0.064	(0.4487)	(0.3223)
Industry-level		0.096	0.066	0.123	0.092	(< 0.0001)	(< 0.0001)

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* Denotes significance at the 1 percent level using a binomial test.

The table compares valuation errors of the one-factor (three-factor) fundamental risk-adjustment model with valuation errors of the CAPM (Fama-French three-factor model) for different levels of beta estimation. Firm-specific, portfolio-level, and industry-level valuation errors are based on value estimates where covariance risk is measured using firm-specific betas, portfolio-level betas (25 size-B/M portfolios) and industry-level betas (48-industries) for the fundamental risk adjustment; cost of equity is estimated at the firm-specific, portfolio, and industry levels for the CAPM and the Fama-French model. Percentage absolute error equals $|(V - P)|/P$, where V equals estimated value and P equals price. Rank error is calculated by first ranking firms each year on V and P separately and dividing the rank by the number of sample firms in that year; absolute rank errors are then calculated as $|(V_R - P_R)|$, where V_R is the rank of V and P_R is the rank of P. % lower error (in column 1) equals the percentage of firms for which the absolute error using fundamental risk adjustment is strictly lower than the absolute error using the benchmark model risk adjustment.

Panel A: Columns (2) and (3) present valuation errors based on the residual income model with fundamental risk adjustment based on excess ROE market beta (i.e., accounting beta). Value is derived by separately estimating *RFPV* and the covariance risk adjustment as described in the text. Columns (4) and (5) present valuation errors of the residual income model with risk adjustment in the discount factors using the risk-adjusted CAPM cost of equity. Panel B: Columns (2) and (3) present valuation errors based on the residual income model with fundamental risk adjustment using excess ROE beta of three factors: market, size, and book-to-market. Columns (4) and (5) present valuation errors of the residual income model with risk adjustment in the discount factors using the risk-adjusted cost of equity based on the Fama-French three-factor model.
In the last two columns of both panels, we present p-values of the one-tailed matched-pair t-test and the two-sample median test of lower valuation errors from the model using fundamental risk adjustment relative to those from the benchmark model (CAPM or Fama-French).

errors of our model with betas estimated at the firm level, portfolio level (25 size-B/M portfolios) and industry level (48 industries), and of the CAPM and the Fama-French model estimated at the firm, portfolio, and industry levels.

From Table 2, Panel A, column (1), based on portfolio-level (industry-level) estimation, 63.1 percent (63.9 percent) of firms have lower absolute valuation error using the one-factor fundamental risk adjustment relative to the CAPM. The one-factor model obtains significantly lower mean and median absolute valuation errors compared to the CAPM at the portfolio and industry levels as indicated by the matched-pair t-statistic as well as the two-sample median test.[25] Median errors at the firm, portfolio, and industry levels are lower than CAPM median errors by 8.8 percent, 33.7 percent, and 34.6 percent, respectively. When accounting beta is estimated at the firm level, while the median valuation error is lower than that of the CAPM, the mean error is higher. Note that, in the case of CAPM errors, the portfolio-/industry-level estimation does not achieve substantial improvement over firm-specific estimation. Results of rank errors follow a similar pattern.

From Panel B of Table 2, our model with risk estimated using three factors obtains significantly lower mean and median valuation errors at all levels of beta estimation compared to the Fama-French three-factor model.[26] Median errors at the firm, portfolio, and industry levels are lower than benchmark-model median errors by 26.4 percent, 60 percent, and 57.6 percent, respectively. Interestingly, while the results of the within-sample regression show that earnings-based size and book-to-market betas have some incremental explanatory power over the accounting beta (Table A1 in Appendix B), we see minimal improvement in valuation errors when risk is estimated *out of sample* using the three-factor model *vis-à-vis* the one-factor model (comparison of Panel A and Panel B). The performance of the standard benchmark models in fact reverses—CAPM valuation errors are consistently *lower* than those from the Fama-French three-factor model.[27] Analysis by subperiods (1982–89, 1990–97, and 1998–2005) shows that median errors of our model are lower than those of benchmark models for both the one-factor and the three-factor models at all levels of estimation for all subperiods (untabulated).

Overall, the improvement achieved by our model is significant in magnitude when risk is estimated using three accounting factors. Notably, even a parsimonious model, where risk is captured by the accounting beta alone, yields significantly lower valuation errors than benchmark models, especially with portfolio- and industry-level estimations. It should be noted that for portfolio- and industry-level estimations, the components of value, namely the risk-free present value and the fundamental risk adjustment, are estimated for each firm with all *firm-level* variables except the betas. Thus, overall risk estimates are obtained for each firm separately, even when we report them as "portfolio" or "industry" level.

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[25] The magnitude of the median valuation error based on the industry-level CAPM cost of equity is close to the median valuation error of 30 percent obtained by Francis et al. (2000).

[26] When t-statistics are corrected for clustering of standard errors by firm and by year (see Petersen 2009), the differences in mean valuation errors obtained from industry- and portfolio-level estimations for both one-factor and three-factor models remain significant; for firm-level estimation, the mean valuation error from the three-factor model becomes insignificantly different from that of the Fama-French model (untabulated).

[27] While multiple risk factors improve risk estimation *within sample* (Fama and French 1993), it is interesting to note that the Fama-French three-factor model leads to higher deviations of value from price relative to the CAPM when risk is estimated *out of sample*, most likely due to the additional noise in estimating multiple betas and factor premia. This is consistent with Fama and French (1997) who show that standard errors of industry cost of equity from the CAPM model are consistently lower than those from the three-factor model under a variety of assumptions about the precision of estimates of factor loadings and risk premia.

Sensitivity Analysis

Since equity valuation inherently relies on estimates and assumptions with respect to various parameters, such as the risk-free rate, market risk premium, and growth rate, we analyze the sensitivity of our value estimates to alternative assumptions.

Alternative Cost of Equity Estimates for Benchmark Models

For the CAPM and Fama-French model, we estimate the cost of equity using the ten-year government bond rate to be consistent with the risk-free rate used in our model. To ensure that our results are not due to our choice of the risk-free rate, we use the one-year T-bill rate as the risk-free rate for all models to conform to standard practice in finance. When we use this alternative risk-free rate, the average valuation errors are lower for our model relative to benchmark models (untabulated).

The CAPM and Fama-French estimates of cost of equity reported in Table 1, Panel A, are upward biased relative to the *implied* cost of equity (reported in Panel B). This result is consistent with the findings of Claus and Thomas (2001), Gebhardt et al. (2001), and Easton and Sommers (2007) that the implied market risk premium is significantly lower than the historical premium. In contrast, the expected return based on fundamental risk (in Table 1, Panel C) does not exhibit systematic bias relative to the implied cost of equity. To address the concern of biased benchmark estimates, we replace the historical average market premium of 6.5 percent (relative to the ten-year government bond rate) by 5 percent or 3 percent in estimating the cost of equity using the CAPM and Fama-French three-factor model. Our (untabulated) results based on the lower market premium show that the average valuation errors for the benchmark models in general decrease, but are still significantly higher than those from our fundamental risk model.

Alternative Residual Income Growth Assumptions for Benchmark Models

The assumption of a constant growth in residual income (say 3 percent) can have a different effect on value estimates based on our model versus the CAPM or the Fama-French model, because residual income is measured differently in these models.[28] If the firm is not in steady state at the end of the forecast horizon, then growth rates for the two residual income measures will differ. We therefore conduct sensitivity analysis by maintaining the 3 percent growth assumption for our model but varying the growth rate between 0 percent and 6 percent for benchmark models.[29] Valuation errors under varying growth-rate assumptions remain significantly lower for our model at all levels of estimation (untabulated). In fact, the changes in benchmark model valuation errors induced by varying growth rates are very slight, supporting the robustness of results with respect to terminal growth-rate assumptions.

Relation between Alternative Risk Measures and Implied Cost of Equity

In addition to evaluating the deviations of value from price for alternative risk-adjustment methods, we also examine the cross-sectional correlation between the *implied* cost of equity and out-of-sample estimates of alternative risk measures: fundamental risk (Covariance Risk/Price) and the CAPM and Fama-French cost of equity. Recall that the implied cost of equity is estimated by inverting the residual income model using the observed price and the same inputs used in estimating other models. In Table 3, we report means of yearly Pearson correlations and test whether the correlation of implied cost of equity with fundamental risk is higher than that with benchmark risk measures using the binomial test. Based on portfolio and industry beta estimation, our results indicate significantly higher correlations of implied cost of equity with the fundamental risk measures (both one- and three-factor) relative to those with the CAPM and Fama-French cost of equity. When fundamental risk is measured based on firm-specific betas, the correlation is significantly higher relative to the CAPM but is indistinguishable from that of the Fama-French three-factor model. Overall, our estimates of fundamental risk map well into the market's expected cost of equity relative to benchmarks.

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[28] While residual income in our model is measured as $[x_{t+j} - r^f B_{t+j-1}]$ (i.e., using the risk-free rate), when applying the CAPM or Fama-French model, residual income is measured as $[x_{t+j} - rB_{t+j-1}]$ (i.e., using the risk-adjusted cost of equity).

[29] Note that the differential effect is relatively minor when we assume a "fade" rate since the fading growth rate is applied to *FROE* (and not to residual income) up to date $t+12$; the differential effect arises only due to the zero residual income growth assumption beyond the horizon $t+12$, which is minor after discounting.

Association of Fundamental Risk Adjustment with Known Risk Proxies

Table 4 reports results examining the relation between fundamentals-based Covariance Risk/Price and commonly used proxies for firm-specific risk used by Gebhardt et al. (2001) and Botosan and Plumlee (2005) to validate alternative estimates of implied cost of equity. We use market beta, size (log of market value of equity), B/M ratio, leverage, analyst forecast dispersion, and expected long-term earnings growth as proxies for firm-specific risk. Consistent with prior literature, we expect covariance risk to be negatively correlated with firm size and positively correlated with market beta, leverage, and B/M. Leverage is measured as long-term debt divided by market value of equity at the end of the previous fiscal year. Dispersion in analysts' forecasts serves as a proxy for information asymmetry and is expected to be positively correlated with covariance risk. Forecast dispersion is measured as the log of the standard deviation of one-year-ahead EPS forecasts obtained from the I/B/E/S Summary file in April of each year, divided by price. Prior empirical evidence suggests a positive association between expected earnings growth and risk (e.g., La Porta 1996). We use the I/B/E/S long-term earnings growth forecast as a risk proxy.

TABLE 3

Correlation between Out-of-Sample Estimates of Alternative Risk Measures and Implied Cost of Equity

One-Factor Model	Fundamental Risk	CAPM	p-value[a]
Firm	0.230	0.076	(< 0.0001)
Portfolio	0.336	−0.063	(< 0.0001)
Industry	0.292	0.056	(< 0.0001)
Three-Factor Model	**Fundamental Risk**	**Fama-French**	**p-value[a]**
Firm	0.248	0.231	(0.3388)
Portfolio	0.345	0.250	(0.0173)
Industry	0.321	0.211	(0.0003)

The table reports means of yearly Pearson correlations between the implied cost of equity and estimates of (1) fundamentals-based Covariance Risk/Price (one-factor and three-factor); (2) CAPM cost of equity; and (3) cost of equity based on the Fama-French three-factor model. Implied cost of equity is estimated by inverting the residual income model with the same inputs as used in the calculation of *RFPV*.

[a] p-value relates to the one-tailed binomial test of significance of the number of sample years in which the correlation between implied cost of equity and fundamental risk is higher than the correlation between implied cost of equity and the benchmark-model cost of equity (i.e., CAPM and Fama-French).

TABLE 4
Association of Fundamentals-Based Risk Estimates with Known Risk Proxies

Panel A: Correlation between Out-of-Sample Estimates of Covariance Risk (Divided by Price) and Risk Proxies

		One-Factor Model			Three-Factor Model		
Variables	**Pred. Sign**	**Firm**	**Portfolio**	**Industry**	**Firm**	**Portfolio**	**Industry**
Beta	+	0.176	0.068	0.215	0.189	0.076	0.185
		(21/0)	(8/1)	(22/0)	(20/0)	(7/1)	(19/0)
Ln(Size)	−	−0.146	−0.335	−0.274	−0.175	−0.336	−0.272
		(0/20)	(0/22)	(0/22)	(0/22)	(0/23)	(0/22)
Leverage	+	0.119	0.328	0.184	0.124	0.296	0.216
		(13/0)	(22/0)	(18/0)	(15/0)	(22/0)	(19/0)
Ln(Disp)	+	0.289	0.374	0.387	0.303	0.360	0.380
		(23/0)	(23/0)	(23/0)	(23/0)	(23/0)	(23/0)
B/M	+	0.234	0.571	0.475	0.250	0.538	0.505
		(22/0)	(23/0)	(23/0)	(22/0)	(23/0)	(23/0)
Growth	+	0.049	−0.064	0.038	0.064	−0.041	0.005
		(8/1)	(1/9)	(7/1)	(11/0)	(1/7)	(6/5)

Panel B: Results of Multivariate Cross-Sectional Regressions of Covariance Risk Estimates on Risk Proxies[a]

		One-Factor Model			Three-Factor Model		
Variables	**Pred. Sign**	**Firm**	**Portfolio**	**Industry**	**Firm**	**Portfolio**	**Industry**
Intercept	?	2.247	1.819	2.080	1.227	1.663	1.606
		(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
UBeta	+	0.297	0.052	0.237	0.156	0.046	0.163
		(0.0002)	(0.0550)	(0.0009)	(0.0003)	(0.0701)	(0.0093)
Ln(Size)	−	−0.036	−0.054	−0.040	−0.030	−0.055	−0.033
		(0.0016)	(0.0001)	(0.0273)	(0.0005)	(0.0018)	(0.0220)
Leverage	+	0.215	0.138	0.082	0.122	0.105	0.103
		(0.0009)	(0.0008)	(0.0193)	(0.0024)	(0.0017)	(0.0005)
Ln(Disp)	+	0.196	0.038	0.074	0.103	0.033	0.076
		(0.0001)	(0.0007)	(0.0001)	(0.0001)	(0.0003)	(0.0001)
B/M	+	0.299	0.401	0.415	0.158	0.299	0.425
		(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Growth	+	0.017	0.009	0.016	0.010	0.008	0.013
		(0.0143)	(0.0001)	(0.0004)	(0.0003)	(0.0001)	(0.0003)
Average Adj. R^2		15.5%	40.1%	34.4%	16.9%	36.5%	33.6%

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[a] Dependent variable is the out-of-sample estimate of covariance risk divided by price.

Panel A reports the means of Pearson correlations across sample years. The numbers in parentheses indicate the number of years in which the correlation is significantly positive/negative.

Panel B reports means of coefficient estimates from cross-sectional regressions estimated yearly over the sample period. The last row reports the adjusted R^2 of yearly regressions averaged over the sample period. p-values in parentheses relate to Newey-West autocorrelation adjusted t-statistics.

Firm, portfolio, and industry relate to covariance risk measured using firm-specific betas, portfolio-level betas (25 size-B/M portfolios) and industry-level betas (48-industries) to obtain the fundamental risk adjustment. Beta is the firm's market beta estimated using monthly returns over the preceding 60 months. UBeta is the firm's unlevered beta, which equals the market beta divided by 1 plus the ratio of long-term debt to shareholders' equity at the end of the previous fiscal year. Ln(Size) is firm size calculated as the log of market value of equity at the end of April of each year. Leverage is measured as long-term debt divided by market value of equity at

(*continued on next page*)

TABLE 4 (continued)

the end of the previous fiscal year. Ln(Disp) is the dispersion in analysts' forecasts measured as the log of the standard deviation of one-year-ahead EPS forecasts obtained from the I/B/E/S summary file in April of each year, divided by price. B/M is the book-to-market ratio measured as the book value of common equity at the end of the previous fiscal year divided by market value of equity at the end of April of each year. Growth equals expected earnings growth proxied by the I/B/E/S analysts' long-term earnings growth forecast.

All risk proxies are winsorized at the upper and lower 1 percent tails of the distribution to mitigate the effect of outliers.

Table 4, Panel A, reports means of yearly correlations between estimates of Covariance Risk/Price and risk proxies. The univariate results indicate that our estimates of covariance risk (both one- and three-factor) are significantly related to the risk proxies. The correlations are in general consistent across sample years in terms of predicted direction and significance except for that with forecasted earnings growth, which is significant in less than half the sample years.[30] Panel B reports the mean coefficient estimates of yearly multivariate cross-sectional regressions together with p-values of the Newey-West autocorrelation adjusted t-statistics.[31] In the multivariate analysis, we use the unlevered CAPM beta rather than the levered beta because the levered beta captures both leverage risk and market risk and thus could obscure the explanatory power of the leverage variable. We expect Covariance Risk/Price to be positively correlated with the unlevered CAPM beta and leverage. Unlevered beta is calculated as the market beta divided by 1 plus the ratio of long-term debt to shareholders' equity as described in standard finance textbooks. The regression results in Panel B show significant coefficient estimates for all risk proxies in the predicted direction for all levels of risk estimation—firm-specific, portfolio, and industry.[32,33] Forecasted earnings growth is also positive and significant as predicted in the multivariate analysis in contrast with its weak significance in Panel A. Overall, the consistently significant association of covariance risk with common proxies for firm risk validates our fundamental risk measurement.

Value-to-Price Ratios and Subsequent Excess Returns for Value and Growth Stocks

While the earnings-based covariance risk can be viewed as a measure of fundamental risk, we would like to know what aspects of risk it captures relative to other standard models. The significant correlation of fundamental risk with the book-to-market ratio reported in Table 4 leads us to inquire whether our risk measure can explain the persistent high returns to value (high B/M) stocks and low returns to growth (low B/M) stocks, the so-called value-growth anomaly.[34] If high book-to-market stocks are underpriced and low book-to-market stocks are overpriced, then we should observe a high value-to-price ratio (V/P) for high B/M stocks and a low V/P ratio for low B/M stocks. On the other hand, if excess returns are observed because the standard models of expected returns mismeasure risk, we should observe no difference in the V/P ratios.

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[30] Contrary to expectation, the correlation of covariance risk with earnings growth is negative for the portfolio beta estimation, because earnings growth has a high negative correlation with B/M, the variable on the basis of which portfolios are formed. In the multivariate analysis, we obtain a positive coefficient on earnings growth after including B/M as an independent variable.

[31] Consistent with standard practice for Newey-West estimation, we use a lag length equal to the smallest integer greater than $T^{.25}$ (Greene 2003, 267), which in our case equals 3. Lag lengths of 1 and 2 yield substantially similar results.

[32] The results are substantially similar to those reported in Table 4 when we use covariance risk divided by *RFPV* (instead of price) or the estimated cost of equity (based on Equation (9)) as the dependent variable.

[33] We also use panel data methods to estimate the regression with year fixed effects and obtain t-statistics corrected for clustering of standard errors by firm and by year, following the procedure in Petersen (2009). The results are consistent with those reported in Table 4, except that the estimated coefficient on size (unlevered beta) becomes insignificant when the dependent variable is covariance risk estimated from the one-factor (three-factor) model.

Panel A of Table 5 reports V/P ratios of B/M quintiles over our sample period for estimations at the firm, portfolio, and industry levels. We report the yearly median V/P ratio using the one-factor (accounting beta) model for each quintile averaged across years. We also report the V/P ratio from the CAPM for comparison.[35] Note that V/P ratios based on CAPM risk adjustment are less than 1 for all portfolios, consistent with the upward bias in the CAPM cost of equity discussed earlier in the sensitivity analysis section. Consistent with prior research, V/P ratios based on CAPM are substantially higher for the highest B/M quintile relative to the lowest B/M quintile at all levels of estimation (Table 5, Panel A). In contrast, the difference in V/P ratios of extreme quintiles is relatively small and statistically insignificant for the one-factor fundamentals-based model. Moreover, the Wilcoxon test shows that the absolute difference in V/P ratios between the highest and lowest quintiles is significantly lower for our model relative to the CAPM. This pattern is consistently observed across the three subperiods (untabulated). The Newey-West autocorrelation-adjusted t-statistic calculated over sample years also indicates that the absolute difference in V/P ratios of extreme B/M quintiles is significantly lower for our model relative to the CAPM.

We also find that, relative to the CAPM, the absolute difference in V/P ratios between the highest and lowest *size* quintiles is significantly lower for our model for the portfolio- and industry-level estimations (untabulated). We do not emphasize these results, however, since the size effect is quite small in our sample, likely because the sample consists of large I/B/E/S firms.

In addition to our price-level analysis in Panel A of Table 5, we also examine excess returns earned by value-growth strategies in the 12 months beginning in the month of May of the valuation year. In contrast with significant excess returns with CAPM risk adjustment, we expect to observe insignificant excess returns to value-growth strategies when expected returns are based on fundamental risk. We estimate excess returns as realized returns minus the expected fundamentals-based (one-factor) cost of equity (from Equation (9)). From column (1) of Table 5, Panel B, subsequent one-year *raw* returns are substantially lower for the lowest B/M quintile relative to the highest B/M quintile. Consistent with the book-to-market effect, excess returns based on the CAPM risk adjustment are substantially lower for the first B/M quintile (growth stocks) relative to the fifth B/M quintile (value stocks) for all estimation levels. When expected returns are calculated based on fundamentals-based (one-factor) cost of equity, we find that the difference in excess returns of the extreme B/M quintiles is insignificant and significantly lower than the difference based on CAPM risk adjustment.

Overall, the "mispricing" of value and growth stocks appears to be negligible when excess returns are calculated based on fundamental risk adjustment (either price-level risk or expected cost of equity). To understand why the CAPM risk adjustment fails to capture

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[34] Note that significant correlation of the risk measure with the book-to-market ratio does not ensure that there is no bias in value estimates of extreme B/M portfolios.

[35] We do not report results based on the Fama-French three-factor model because we expect the difference in V/P ratios of extreme B/M quintiles to be indistinguishable, given that the model is designed to capture this difference by explicitly incorporating the book-to-market effect.

TABLE 5
Estimated Value-to-Price (V/P) Ratios and Future Excess Returns of Book-to-Market (B/M) Quintiles

Panel A: V/P Ratios of B/M Quintiles

	Fundamental Risk			CAPM		
B/M Quintiles	**Firm**	**Portfolio**	**Industry**	**Firm**	**Portfolio**	**Industry**
Q1 (Growth)	1.045	1.009	1.016	0.618	0.583	0.598
Q2	1.057	0.999	0.993	0.725	0.688	0.698
Q3	1.064	0.989	0.993	0.843	0.789	0.803
Q4	1.087	0.963	1.003	0.987	0.861	0.944
Q5 (Value)	1.122	0.946	0.966	0.958	0.880	0.954
Q5 − Q1	0.077	−0.064	−0.050	0.340**	0.297**	0.356**
Wilcoxon (Diff)[a]				(< 0.0001)	(< 0.0001)	(< 0.0001)
t-test (Diff)[b]				(< 0.0001)	(< 0.0001)	(< 0.0001)

Panel B: Subsequent-Year Excess Returns (ER_{t+1}) of B/M Quintiles

		ER_{t+1}: Fundamental Risk			ER_{t+1}: CAPM		
B/M Quintiles	R_{t+1}	**Firm**	**Portfolio**	**Industry**	**Firm**	**Portfolio**	**Industry**
Q1 (Growth)	0.1065	0.0048	0.0047	0.0057	−0.0315	−0.0338	−0.0338
Q2	0.1006	−0.0153	−0.0122	−0.0148	−0.0368	−0.0382	−0.0363
Q3	0.1301	0.0090	0.0116	0.0129	0.0038	−0.0020	−0.0001
Q4	0.1490	0.0317	0.0274	0.0283	0.0269	0.0212	0.0257
Q5 (Value)	0.1439	0.0146	0.0125	0.0130	0.0176	0.0117	0.0167
Q5 − Q1	0.0374	0.0099	0.0078	0.0073	0.0491*	0.0454*	0.0505*
Wilcoxon (Diff)[a]					(< 0.0001)	(< 0.0001)	(< 0.0001)
t-test (Diff)[b]					(< 0.0001)	(< 0.0001)	(< 0.0001)

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*, ** Denote significance of the Newey-West autocorrelation adjusted t-statistic at the 5 percent and 1 percent level, respectively.

[a] p-value of one-tailed test of lower (Q5 − Q1) for fundamental risk adjustment compared to that for CAPM.

[b] p-value of one-tailed t-test (similar to the Fama-MacBeth test with Newey-West autocorrelation adjustment) of lower (Q5 − Q1) for fundamental risk adjustment compared to that for CAPM over sample years.

B/M quintiles are formed at the end of April of each year. B/M ratio is calculated as book value of common equity as of the beginning of the valuation year divided by price at the end of April of the valuation year.

In Panel A, *V/P* ratio equals value estimate divided by price at the end of April of each year. Median *V/P* ratios are calculated each year for each quintile and then averaged across years. Firm, portfolio, and industry *V/P* ratios are based on value estimates where covariance risk is measured using firm-specific betas, portfolio-level betas (25 size-B/M portfolios) and industry-level betas (48-industries) for the fundamental risk adjustment; cost of equity is estimated at the firm-specific, portfolio, and industry levels for the CAPM. In Panel A, columns (1) to (3) present *V/P* ratios where value is estimated from the residual income model with fundamental risk adjustment based on one factor: excess market ROE. Columns (4) to (6) present *V/P* ratios where value is estimated from the residual income model using the risk-adjusted CAPM cost of equity as the discount factor. (Q5 − Q1) is the difference between *V/P* ratios of the fifth and the first quintiles.

In Panel B, R_{t+1} equals buy-and-hold (raw) returns for the period of 12 months beginning in the month of May of the valuation year averaged across years (column 1). ER_{t+1} equals one-year excess returns calculated as realized returns, R_{t+1}, minus expected returns. For columns (2) to (4), expected returns are calculated based on fundamental risk adjustment, as $[r^f + \text{Covariance Risk/P} * (r^f - g)]$, where covariance risk is estimated at the firm-specific, portfolio, and industry levels. For columns (5) to (7), expected returns are calculated based on the CAPM, where beta is estimated at the firm-specific, portfolio, and industry levels. (Q5 − Q1) is the difference in excess returns of the fifth and the first quintiles.

the risk differences of value-growth stocks while the fundamental risk adjustment does, we examine some primitive variables of these portfolios. Untabulated results show that the volatility of residual earnings of value stocks is 63 percent higher than the volatility of residual earnings of growth stocks (standard deviation: 0.070 versus 0.043). On the other hand, the return volatility of value stocks is only 3 percent higher than that of growth stocks (0.090 versus 0.087). Hence, it appears that the high fundamental risk (arising from high earnings volatility) of value stocks is not reflected in the variation in returns.

Our results indicate that risk measurement based on residual earnings captures some aspects of risk reflected in the B/M ratio, suggesting that the value-growth "anomaly" indicates risk mismeasurement rather than mispricing. We acknowledge that these results can be attributed to the use of book value as an input in the estimation of the residual income covariance risk. However, the fact that book value arises theoretically as a component of the risk term is more appealing than an *ad hoc* addition of the book-to-market factor in multi-factor models. Thus, our analysis provides a theoretical rationale for the significance of the book-to-market ratio in risk assessment that heretofore has remained unexplained.

Link with Related Studies

Our results are consistent with recent findings in the finance literature explaining the "mispricing" of value and growth stocks. Campbell and Vuolteenaho (2004) decompose the CAPM beta into two betas: one reflecting news about the market's discount rate and the other about the market's future cash flows. From a regression of average portfolio excess returns on the two estimated betas, they find that the cash flow beta carries a higher price of risk than the discount rate beta. Their main finding is that, relative to growth stocks, value stocks have higher cash flow betas ("bad" betas) with a higher risk premium that explains the higher returns to these stocks. They conclude that CAPM risk adjustment fails to explain the B/M effect because the CAPM beta does not differentiate cash flow beta from discount rate beta. Note, however, that Campbell and Vuolteenaho (2004) estimate cash flow betas as residuals from returns after controlling for proxies of discount rate news. In our analysis, we *explicitly* estimate "cash flow" risk from fundamentals and obtain results consistent with their explanation of the value-growth anomaly.

Cohen et al. (2009) address the issue of cash flow risk from a different perspective. They use the Feltham-Ohlson residual income valuation framework and decompose the cross-sectional variance of the market-to-book ratio into two components, one due to risk-adjusted fundamental value and the other due to mispricing. In an *ex post* analysis, they show that when risk is measured by "cash flow" covariances (measured by ROE covariances), the variance share of mispricing of value and growth stocks is negligible. While Cohen et al. (2009) arrive at the same conclusion as we do in terms of value-growth mispricing, their procedure relies on within-sample estimation using a long time-series of data (72 years), which precludes firm-level estimation for most firms. As such, they do not tackle the problem of implementing fundamental risk adjustment to obtain firm value in a practical setting.

Practical Applications

Our approach to risk estimation can be used in the practical valuation of securities. First, one can estimate the cost of equity based on the accounting beta using the formula in Equation (9) and apply it as a discount factor in any valuation model, residual income or DCF. Fundamentals-based cost of equity can lead to better risk assessment for stock selection and portfolio management decisions. Since industry betas produce superior value estimates relative to firm-specific betas, analysts/investors can estimate the fundamentals-based cost of equity with a parsimonious set of inputs using an industry-specific accounting beta.

Second, our risk estimation approach can potentially be used even when the past history of returns is not available for a firm, for example, in the case of initial public offerings or companies that are privately held or thinly traded. However, while our approach does not require stock return history, it does require adjustment when applied to companies for which the *stock price* is not available, for example, unlisted companies. In such cases, we propose estimating covariance risk as a proportion of *RFPV* of the previous period.[36] Although theoretically not an ideal alternative, when *RFPV* instead of price is used as the deflator, valuation errors are statistically indistinguishable between our one-factor model and the CAPM and significantly lower for our three-factor model relative to the Fama-French model (untabulated).

We validate our risk adjustment by using the valuation-error criterion, which implicitly assumes that the market correctly values the security. By relaxing this assumption when valuing individual securities, one could potentially use our approach to identify mispriced stocks. If our fundamental risk measure captures information about risk that is missed by a returns-based measure, then alpha technologists can construct trading strategies that buy (short) stocks for which risk is overestimated (underestimated) by returns-based measures relative to fundamental measures.

V. CONCLUDING REMARKS

The emphasis in valuation has been gradually shifting to valuation based on fundamentals as evidenced by the gaining popularity of EVA®-type models. Empirical applications of valuation based on fundamentals include studies of market risk premium, effect of accounting disclosures on cost of equity (e.g., Botosan 1997), and corporate finance issues (e.g., D'Mello and Shroff 2000). Thus, researchers and practitioners increasingly measure payoffs using fundamentals, but continue to measure risk from returns when valuing securities. While some attempts have been made to trace the source of risk captured by returns-based measures to economic fundamentals, fundamentals-based risk adjustment in valuation remains a theoretical ideal. In this study, we derive a simplified covariance risk adjustment and the equivalent cost of equity based on accounting variables.

Our empirical results indicate that valuation errors obtained from value estimates based on fundamental risk adjustment are significantly lower than those from returns-based benchmark models. We validate the fundamental risk estimates by demonstrating their significant and consistent association with known proxies for firm-specific risk. Further, we find that the fundamentals-based risk adjustment provides a risk measurement that largely accounts for the "mispricing" attributed to the book-to-market effect.

Our research contributes to the valuation literature by developing a methodology for implementing fundamentals-based risk adjustment in a practical valuation exercise. We propose that the one-factor accounting beta-based risk adjustment can be implemented without undue complexity and can be used in practical valuation when market measures of risk are not available. Of course, fundamental risk adjustment comes at a cost—risk measures are noisier than returns-based measures due to the short time-series of earnings data available for estimation. Efforts to reduce noise in beta estimation (perhaps using a deseasonalized quarterly earnings series) can further improve risk estimation at the firm level relative to commonly used alternatives. Our analysis leads us to several related issues for future inquiry, in particular, examining whether value estimates based on fundamental risk can identify mispriced stocks, and establishing a linkage with other studies that use properties of accounting earnings such as accruals quality and earnings predictability as measures of information risk (e.g., Francis et al. 2004, 2005).

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[36] Recall that we estimate covariance risk *as a proportion of value* in the previous period and then use this estimate to obtain the out-of-sample covariance risk as a proportion of value in the current period. Since "value" is unobservable, we use the previous year's price as a proxy for value in our estimation procedure.

APPENDIX A
DERIVATION OF COVARIANCE RISK ADJUSTMENT

A general representation of the present value of expected dividends formula is expressed as $V_t = E_t \sum_{j=1}^{\infty} \tilde{m}_{t,t+j}\tilde{d}_{t+j}$ (Equation (1)).[37] In Section II, we assume the clean surplus relation, and rewrite Equation (1) as $V_t = B_t + E_t \sum_{j=1}^{\infty} \tilde{m}_{t,t+j}\tilde{x}^a_{t+j} = \left(B_t + \sum_{j=1}^{\infty} \frac{E_t[\tilde{x}^a_{t+j}]}{R^f_{t,t+j}}\right) + \left(\sum_{j=1}^{\infty} Cov_t[\tilde{m}_{t,t+j}, \tilde{x}^a_{t+j}]\right)$.

This Appendix derives a simplified expression for the covariance risk term:

$$Risk\ Adjustment_t = \sum_{j=1}^{\infty} Cov_t[\tilde{m}_{t,t+j}, \tilde{x}^a_{t+j}]. \tag{1A}$$

The derivation that follows assumes an arbitrary but nonstochastic dividend payout policy, $\{k_{t+j}\}_{j=1}^{\infty}$. Replacing the first period's residual earnings with excess ROE times beginning book value, we obtain:

$$Cov_t[m_{t,t+1}, x^a_{t+1}] = B_t Cov[m_{t,t+1}, EROE_{t+1}] \equiv B_t Cov[m, EROE]. \tag{2A}$$

For the second period's residual earnings, we split the stochastic discount factor into two parts (i.e., $m_{t,t+2} = m_{t,t+1}m_{t+1,t+2}$), and express the covariance of excess ROE_{t+1} with the contemporaneous discount factor, $m_{t+1,t+2}$:

$$\begin{aligned} Cov_t[m_{t,t+2}, x^a_{t+2}] &= Cov_t[m_{t,t+1}m_{t+1,t+2}, B_{t+1}EROE_{t+2}] \\ &= \frac{E_t[B_{t+1}]}{(1 + r^f)^{t+1}} Cov[m, EROE] \\ &\quad + \{B_t(1 - k_{t+1})Cov[m, ROE]Cov[m, EROE] \\ &\quad + \frac{1}{1 + r^f} B_t(Cov_t[m_{t,t+1}, E_{t+1}[EROE_{t+2}]] \\ &\quad + (1 - k_{t+1})Cov_t[m_{t,t+1}, ROE_{t+1}E_{t+1}[EROE_{t+2}]])\}. \end{aligned} \tag{3A}$$

Equation (3A) is derived by assuming that $Cov_{t+j-1}[m_{t+j-1,t+j}, EROE_{t+j}] = Cov[m, EROE]$, all j. This assumption is consistent with the common practice in empirical estimations of cost of equity where beta is estimated using contemporaneous market factors and assumed to be constant over time. Further, for ease of implementation in an empirical setting, we ignore the relatively small term that appears within the braces on the RHS of Equation (3A), and obtain:

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[37] In all our analyses, our expectation, $E[.]$, is based on objective (true) probabilities and not risk-neutral probabilities.

$$Cov_t[m_{t,t+2}, x^a_{t+2}] \approx \frac{E_t[B_{t+1}]}{(1 + r^f)} Cov[m, EROE]. \tag{4A}$$

While fewer assumptions will result in a more general risk adjustment, our goal is to obtain a theoretically sound risk measure that can be practically implemented with relative ease. Based on the data in this study, we find that, on average, the magnitude of the term within braces in Equation (3A) that is omitted in Equation (4A) ranges from 0.19 percent to 1.7 percent of the magnitude of the first term on the RHS of Equation (3A), suggesting that this is a good approximation in practice. The range of possible values of the omitted term is established by employing the following alternative assumptions: (i) $E_{t+1}[EROE_{t+2}] = E_t[EROE_{t+2}]$, which obtains 0.19 percent; (ii) $E_{t+1}[EROE_{t+2}] = E_t[EROE_{t+2}] + \varepsilon_t$, which obtains 1.7 percent; and (iii) $E_{t+1}[EROE_{t+2}] = a + bE_t[EROE_{t+2}] + \varepsilon_t$, which obtains 1.3 percent. Assumption (i) implies that the expectation of excess ROE remains constant over time; (ii) assumes that the expectation follows a random walk; and (iii) assumes an autoregressive process. The estimates of the intercept (a) and slope coefficient (b) in assumption (iii) are obtained from a regression of one-year-ahead excess ROE forecast of analysts issued in period $t+1$ on the two-year-ahead excess ROE forecast issued in period t (our estimates of the average intercept and slope coefficient equal 0.006 and 0.91, respectively). Based on the same assumptions that derive (4A), we obtain for any j, $Cov_t[m_{t,t+j}, x^a_{t+j}] \approx \frac{E_t[B_{t+j-1}]}{(1 + r^f)^{j-1}} Cov[m, EROE]$.

Summing terms in (1A), we obtain:

$$Risk\ Adjustment_t \approx \sum_{j=0}^{\infty} \frac{E_t[B_{t+j}]}{(1 + r^f)^j} Cov[m, EROE]. \tag{5A}$$

Observation 1: (5A) holds exactly in the case of a full dividend payout policy, $k_{t+j} = 1$, all j.

Observation 2: Under the assumption of nonstochastic growth in book values, the formula (5A) holds exactly.

Observation 3: One can derive the exact expression (as opposed to an approximation) for the risk-adjustment term under the assumption that, $B_{t+j} = B_t(1 + g + \varepsilon_{t+j})^j$, $\varepsilon_{t+j} \sim i.i.d.$ Risk adjustment then equals:

$$Risk\ Adjustment_t = \sum_{j=0}^{\infty} \frac{E_t[B_{t+j}]}{(1 + r^f)^j} Cov[m, EROE] + \Omega \tag{6A}$$

where $\Omega = \frac{(1 - k)Cov[m, ROE](1 + r^f)}{r^f - g - (1 - k)Cov[m, ROE](1 + r^f)} \sum_{j=0}^{\infty} \frac{E_t[B_{t+j}]}{(1 + r^f)^j} \left(Cov(m, EROE) + \frac{E(EROE)}{1 + r^f}\right)$.

Based on the data in this study, the average magnitude of the second term relative to the first term on the RHS of Equation (6A), that is, $\Omega / \sum_{j=0}^{\infty} \frac{E_t[B_{t+j}]}{(1 + r^f)^j} Cov[m, EROE]$, equals 0.045. Thus, even for the infinite sum, our approximation of $\Omega = 0$ is reasonable in practice and at the same time facilitates implementation.[38]

APPENDIX B
EXPLANATORY POWER OF ACCOUNTING RISK MEASURES FOR PRICED RISK

From a within-sample analysis, we first determine the risk factors that exhibit explanatory power for priced risk and then use these risk factors to estimate covariance risk out of sample, as explained in Section III. We estimate the cross-sectional regression (14) with intercept separately for each year of our sample period:

$$\frac{(RFPV_t - P_t)}{P_t} = c_0 + c_1 Cov_{ACCT} + c_2 Cov_{ESMB} + c_3 Cov_{EHML} + v_t.$$

TABLE A1

Results of Cross-Sectional Regression of Priced Risk on Accounting Risk Measures Estimated over Each Year of the Sample Period

$$\frac{(RFPV_t - P_t)}{P_t} = c_0 + c_1 Cov_{ACCT} + c_2 Cov_{ESMB} + c_3 Cov_{EHML} + v_t$$

Intercept	Cov_{ACCT}	Cov_{ESMB}	Cov_{EHML}	Avg. Adj. R^2
1.0712	0.0047			6.73%
(0.0001)	(0.0003)			
1.1224		0.0018		3.62%
(0.0001)		(0.0308)		
1.1394			0.0015	2.32%
(0.0001)			(0.0326)	
1.0681	0.0044	0.0006	0.0005	7.82%
(0.0001)	(0.0001)	(0.0274)	(0.0458)	

Dependent variable is priced risk $(RFPV - P)/P$.

p-values of Newey-West autocorrelation adjusted (Fama-MacBeth) t-statistics are reported in parentheses.

Means of coefficient estimates from year-wise regressions are reported.

Variable Definitions:

$RFPV$ = risk-free present value that is derived from the residual income model using current book value, forecasted ROEs, forecasted book values, and the risk-free rate as laid out in Equation (4);

Cov_{ACCT}, Cov_{ESMB}, and Cov_{EHML} = K_t times β_{ACCT}, β_{ESMB} and β_{EHML} respectively (scaled by price), where K_t is defined in Equation (6); and

β_{ACCT}, β_{ESMB}, and β_{EHML} = estimated slope coefficients from the firm-by-firm regression of a firm's excess ROE on market excess ROE, ROE of the SMB portfolio (small minus large) and ROE of the HML portfolio (high minus low book-to-market), respectively (Equations (11), (12), and (13)).

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[38] We thank Stephen Penman for pointing out that our derivation does not explicitly include the risk in investment growth. While in general this risk should be estimated separately, under our assumption of nonstochastic payout k, the risk in investment growth is fully captured by the risk in ROE.

The dependent variable is the discount for risk implicit in price (priced risk) and the independent variables are accounting risk measures: Cov_{ACCT}, Cov_{ESMB}, and Cov_{EHML}, which reflect the sum of covariances of a firm's residual earnings with the market, size, and book-to-market factors in earnings, respectively.[39] The cross-sectional regression is estimated each year and coefficient means across years are reported in Table A1 along with the Fama-MacBeth t-statistics with Newey-West autocorrelation adjustment.

Cov_{ACCT}, has significant explanatory power for priced risk and has significant incremental explanatory power over the earnings-based size and book-to-market risk measures. The coefficient estimates of the earnings-based size measure (Cov_{ESMB}) and book-to-market measure (Cov_{EHML}) are also significant in both univariate and multivariate regressions. Results of year-wise multivariate regressions show that the risk measure based on the accounting beta has significant explanatory power ($\leq$ 5 percent level) in 22 of 24 years, in contrast with the earnings-based size and book-to-market measures which obtain significance only in 7 and 4 (out of 24) years, respectively (untabulated). Overall, it appears that the three risk measures each have some explanatory power for priced risk, with the measure based on the accounting beta exhibiting the strongest association. In the out-of-sample estimation of covariance risk, we use all three measures and also the accounting beta alone and examine how value estimates based on the three-factor model versus the one-factor model compare with price.

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[39] For the cross-sectional analysis, we winsorize excess ROE betas at the upper and lower 1 percent tails of the distribution to reduce noise.

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Concede or Deny: Do Management Persuasion Tactics Affect Auditor Evaluation of Internal Control Deviations?

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ABSTRACT: In an internal control audit, the consequences and assessment subjectivity of control problems motivate managers to try to persuade auditors to lower the assessed severity of an observed control deviation. We report an experiment in which 106 audit seniors evaluate either information technology (IT) or manual control deviations that are potentially indicative of significant deficiencies, after exposure to persuasion tactics based in either concession or denial. For IT control deviations, we find that auditors assess the significance of deficiency lower and the perceived adequacy of management's explanation higher for concessions than for denials. For manual control deviations, we find no differences between concessions and denials. Our results provide evidence of a systematic bias in auditor judgment and indicate a rationale for the ubiquity of management persuasion attempts around control deviations—sometimes they work.

Keywords: *internal control deficiency; audit judgment; persuasion tactic.*

Data Availability: *Contact the authors.*

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I. INTRODUCTION

We study when and how management persuasion tactics lower auditor assessment of a potential significant deficiency arising from an internal control deviation. A control deviation is a breakdown in internal control that is evidence of a control deficiency. Deviations assessed as significant deficiencies must be reported to the audit committee, can accumulate to a material weakness resulting in an adverse Sarbanes-Oxley 404 (SOX) audit opinion, and demand remediation (PCAOB 2007, paras. 65, 75, and 80). As a result, managers have incentives to persuade auditors that an observed control deviation is not a significant deficiency. Professional skepticism, however, requires auditors to ignore management's persuasion tactics (PCAOB 2007, para. 4). In an internal control audit, assessing the significance of a deficiency that arises from a control deviation is complex and subjective, which creates the potential for management persuasion tactics to inappropriately influence auditor judgment.

We study two types of persuasion tactics: *concessions* that admit a control deficiency occurred and *denials* that argue against the presence of a control deficiency. We also study two types of control deviations: *IT* and *manual*. We theorize that concessions, but not denials, become effective persuasion tactics when perceived management blame for a control deviation is reduced. We further theorize that the technology element present in an IT control deviation will reduce perceived management blame for the deviation, even though the technology element is irrelevant to assessing the significance of deficiency. Combining theoretical expectations, we predict that within IT control deviations, concessions will lower auditor-assessed significance of deficiency more than denials. We predict no difference in auditor-assessed significance of deficiency between concessions and denials for manual control deviations.

Research in psychology indicates that the effectiveness of concession and denial is determined by their net cost or benefit (Kim et al. 2004; Tata 2002). Concession is costly because admission of guilt for a control deviation results in the assignment of management blame. Management blame implies that management could have done more to prevent the control deviation. The benefit of concession is the positive signal that management accepts responsibility for internal control. Information that reduces perceived management blame reduces the cost of concession. This changes the net cost-benefit of concession and can make concession an effective persuasion tactic.

Denial is costly because it sends a negative signal that management fails to accept responsibility for a breach in internal control. This negative signal is costly because it implies that management is abdicating its fundamental responsibility for compliance with SOX (PCAOB 2007, para. 75). The benefit of denial is achieving a disassociation between a control deviation and a control deficiency. However, given management's self-serving incentives to avoid reporting a deficiency, denial lacks credibility if, prior to the denial, auditors have already observed a control deviation that indicates a deficiency. Further, information that reduces perceived management blame cannot completely undo the evidence-based association between an observed control deviation and a control deficiency. In this setting, we expect the cost of denial to exceed its benefit regardless of the presence or absence of information that reduces management blame.

Control deviations can occur due to breakdowns in IT or manual controls. In IT control deviations, the technology element is irrelevant because only the manual/human element of an IT control can fail when the control is properly designed and protected from change. However, the human-computer interaction literature indicates that the presence of technology reduces human blame regardless of the relevance of technology to a failure event (Kelton et al. 2008; Naquin and Kurtzberg 2004; Nissenbaum 1994). Since explanations of

IT control deviations necessarily contain information about technology, we expect perceived management blame will be reduced. In contrast, explanations of manual control deviations normally do not contain information that reduces perceived management blame. In the absence of such information, human failure stands alone and management is held more accountable (Morris et al. 1999; Naquin and Kurtzberg 2004).

We posit that explanations of IT control deviations will result in reduced management blame that will make concession, but not denial, an effective persuasion tactic. Therefore, we predict that concession will lower auditor-assessed significance of deficiency more than denial for IT control deviations. In contrast, we do not expect explanations of manual control deviations to contain information that mitigates management blame. Therefore, we predict no difference in auditor-assessed significance of deficiency between concession and denial for manual control deviations.

In an experiment, 106 audit seniors from a Big 4 public accounting firm evaluated internal control deviations that were potentially indicative of significant deficiencies. The deviations were embedded in case studies that included a vignette conversation between the audit senior and management. We manipulated, between auditors, the type of persuasion tactic, concession or denial, and the type of control deviation, IT or manual.[1] As predicted, auditors assess the significance of deficiency arising from IT control deviations lower for concession than for denial. Also as predicted, auditors assess the significance of deficiency arising from manual control deviations no differently for concession and denial. We also examine how auditors perceive the adequacy of management's explanation. As expected, auditors perceive the adequacy of management's explanation higher for concession than for denial when evaluating IT control deviations. Conversely, auditors perceive the adequacy of management's explanation no differently for concession and denial when evaluating manual control deviations.

In supplemental tests, we find that auditors blame management less for IT than for manual control deviations. Consistent with theory, we find evidence that lower management blame results in lower assessed significance of deficiency for concession, but not for denial. Finally, we find evidence that explanation adequacy is negatively related to the assessed significance of deficiency for both IT and manual control deviations. Further, explanation adequacy fully mediates the effects of persuasion tactics on the assessed significance of deficiency.

Our findings contribute to practice. Auditing Standard (AS) No. 5 requires auditors to exercise professional skepticism and form an independent opinion when assessing control deficiencies (PCAOB 2007, paras. 4 and 85). We observe a lack of skepticism in auditor judgment when management persuasion tactics lower the assessed severity of a potential significant deficiency. This is important because prior research reports that auditors frequently encounter significant deficiencies and 20 percent of significant deficiencies are associated with financial misstatement (Bedard and Graham 2008). Further, lowering the assessed severity to less than a significant deficiency eliminates the need to inform the audit committee of the deficiency, changes the auditor's deficiency accumulation analyses, and obviates the timely remediation of the deficiency (PCAOB 2007, paras. 65, 75, and 80).

Our findings also contribute to the accounting literature. Auditor negotiations with management over subjective issues are pervasive (Trotman et al. 2005) and irrelevant information is routinely present in the audit (Hackenbrack 1992). We extend the audit explanation literature by demonstrating how management persuasion tactics can interact with irrelevant information. In addition, we show that the perceived adequacy of management's explanation has a strong effect on related auditor judgments, an effect not acknowledged in auditing standards. Finally, we extend prior research on internal control evaluation as part of the financial statement audit to that of a SOX 404 internal control audit.

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[1] Following AS No. 5, all control deviations had a direct effect on the financial statements.

The next section provides background and develops hypotheses. Section III describes the experiment and Section IV presents results. Section V concludes with a discussion of the study's implications and limitations.

II. BACKGROUND AND HYPOTHESES

AS No. 5 delineates standards for the audit of internal control and requires two types of tests of control: design effectiveness and operating effectiveness (PCAOB 2007, paras. 42–45). Tests of design effectiveness determine if controls could effectively prevent or detect errors. Tests of operating effectiveness indicate whether the controls actually work and follow tests of design effectiveness because only properly designed controls need be tested to assure proper operation. We focus on auditor evaluation of control deviations in tests of operating effectiveness.

Auditors are required to evaluate all observed control deviations to determine whether they indicate deficiencies in internal control (PCAOB 2007, para. 48). If a control deviation is deemed a deficiency, then the auditor must assess the severity of the deficiency (PCAOB 2007, para. 62). The severity of a deficiency depends on the possibility that management's controls will fail to prevent or detect an error and the magnitude of the potential error (PCAOB 2007, para. 63). The highest severity level is material weakness, which directly results in an adverse opinion on internal control. Deficiencies that are less severe but important enough to merit attention by management are classified as significant deficiencies (PCAOB 2007, para. A11).

We focus on significant deficiencies because they are important in their own right and are more common than material weaknesses. Auditors must report all significant deficiencies to the audit committee and management must provide written representation that they have remediated previously identified significant deficiencies (PCAOB 2007, paras. 75 and 80). In addition, significant deficiencies can lead to a material weakness when accumulated with other deficiencies or when uncorrected after a reasonable period of time (PCAOB 2007, paras. 62 and 65). Finally, auditors often encounter significant deficiencies and these deficiencies have serious implications for financial reporting. In a study of 3,990 control deficiencies, Bedard and Graham (2008) report that 461 (11.6 percent) are classified as significant deficiencies, three times more than material weaknesses, and 20 percent of significant deficiencies are directly associated with financial misstatement.[2]

Auditors commonly use management inquiry when assessing the significance of a deficiency because management is responsible for internal control and makes its own assessment of the effectiveness of internal control (PCAOB 2007, para. 75). When management initially discovers and assesses control deficiencies, Bedard and Graham (2008) report that they under-assess 64.8 percent of the deficiencies that become auditor-assessed significant deficiencies, which is consistent with a management motivation to avoid significant deficiencies. Differences between management and auditor deficiency assessments generate a new source of auditor-manager tension. Prior to SOX, auditors evaluated internal control to plan financial statement audit procedures and could usually audit around deficiencies by increasing the scope of substantive tests (Ashton 1974; Libby et al. 1985). Now, auditors must perform an audit of internal control, directed by professional guidance that carries specific reporting consequences and remediation duties (PCAOB 2007). As a result, managers have incentives to try to persuade auditors that observed control deviations are not significant deficiencies.

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[2] We were also motivated to study significant deficiencies for theoretical reasons. Psychology research indicates that persuasion tactics are more likely to affect judgment when targeted at failure events that are not highly severe, because highly severe failure events polarize judgment (Shapiro et al. 1994). Theoretically, auditors are less likely to be influenced by persuasion tactics when they are targeted at a single severe deviation indicative of a potential material weakness. While significant deficiencies are important, they are less severe than material weaknesses; therefore we expect auditors are more likely to be influenced by persuasion tactics targeted at a deviation indicative of a potential significant deficiency.

Professional guidance requires auditors to use professional skepticism when performing management inquiry and to ultimately form their own, independent assessment (PCAOB 2007, para. 4). Consequently, auditors must separate management persuasion tactics from factual information when assessing the significance of a deficiency. However, assessing the significance of a deficiency is complex and subjective, which creates the potential for persuasion tactics to influence auditor judgment (Boury and Spruce 2005; Heuberger and Nepf 2005). We study two types of management persuasion tactics, concessions and denials, because they are at opposing ends of the theoretical spectrum of persuasion tactics and anecdotal evidence indicates that both tactics are used.[3]

Concessions and Denials

A concession (denial) is the acceptance (rejection) of culpability for a failure event (Tata 2002). The psychology literature on persuasion tactics indicates that concession and denial produce different costs and benefits (Kim et al. 2004, 2006). The cost of concession is the blame that results from admitting guilt for a failure event. The benefit of concession is signaling acceptance of responsibility for a failure event, implying intention to avoid future failures (Bottom et al. 2002; Kim et al. 2004; Ohbuchi et al. 1989; Schwartz et al. 1978). Conversely, the cost of denial is the failure to accept responsibility, which suggests no need to rectify behavior. Thus, denial raises concerns about future actions to the extent that there are lingering concerns about culpability. The benefit of denial is potential disassociation from a failure event (Kim et al. 2004). Following this reasoning, we begin by considering the relevant cost and benefit of conceding or denying that a control deviation is a deficiency.

The cost of an internal control concession stems from the admission that a deviation is an internal control breakdown. By admitting that internal control failed, management accepts blame for the failure because management is responsible for internal control (PCAOB 2007, para. 75). Management blame for a control deviation is costly because it implies that a control deviation could have been prevented, confirming and strengthening evidence of a control deficiency (PCAOB 2007, paras. 48 and 75). With respect to benefits, concession sends a positive signal that management appropriately accepts responsibility for internal control. On its own, we expect the cost of concession to outweigh its benefit. The cost of concession, accepting blame for a control deviation, directly addresses evidence of a control deficiency, but the benefit does not, because accepting responsibility for a control deviation is tangential to assessing the significance of a deficiency. In the absence of information that changes this cost-benefit trade-off, we expect the cost of concession to outweigh its benefit, making concession an ineffective persuasion tactic.

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[3] An informal poll of auditors indicates that it is common for clients to take self-serving views of deviations and attempt to persuade the auditor, either by conceding a low-severity deficiency or completely denying the deficiency assessment. Because a group of lower-level deficiencies can sum to a higher-level internal control deficiency (PCAOB 2007), the auditors we polled indicate that manager concern is not strongly limited by a materiality threshold, and managers tend to challenge all deficiency assessments.

We posit that irrelevant, non-diagnostic information combined with a concession can dilute the cost of accepting blame and change the effect of a concession to a net benefit. A dilution effect can occur in the presence of non-diagnostic information, defined as information that has little or no value for predicting an outcome (Nisbett et al. 1981; Hackenbrack 1992). Dilution effects are explained by the representativeness heuristic (Tversky and Kahneman 1974). Non-diagnostic information that implies less management fault for a control deviation can dilute the amount of blame assigned to management for a control deviation (Nisbett et al. 1981). Because management blame is the reason the cost of concession is high, diluting perceived management blame directly reduces this cost. At the same time, the benefit of accepting responsibility remains intact. Reducing the cost of concession while leaving its benefit intact can make concession an effective persuasion tactic for reducing the assessed significance of a deficiency.

The cost of denial is the negative signal that management fails to accept responsibility. This signal is a "red flag" to auditors because it violates a core requirement underlying the audit of internal control per AS No. 5 (PCAOB 2007, para. 75). Conversely, the benefit of denial is the possibility that the auditor will disassociate a control deviation from a deficiency. However, unlike social or political settings in which evidence is based on hearsay when a denial is made (Kim et al. 2004), auditors possess evidence of a control deviation indicative of a control deficiency prior to management's denial. Given management incentives to avoid reporting a deficiency, a spoken denial can lack credibility and fail to reverse the evidence of an observed control deviation.[4] We do not expect denial to obtain the benefit of disassociation. As a result, we expect the cost of denial to outweigh its benefit, making denial an ineffective persuasion tactic.

Combining non-diagnostic information that dilutes management blame with a denial is unlikely to make denial effective. The cost and benefit of denial rely on auditor perception of whether a deficiency occurred. Non-diagnostic information that dilutes management blame cannot completely reverse the diagnostic evidence of an observed control deviation. That is, dilution effects of non-diagnostic information can weaken judgments made from diagnostic information, but non-diagnostic information cannot completely undo diagnostic outcome information (Nisbett et al. 1981). Thus, the benefit of disassociating a deviation from a deficiency is not attained. Moreover, the "red flag" violation of professional standards continues. We therefore expect that denial is an ineffective persuasion tactic regardless of the presence or absence of non-diagnostic information that dilutes management blame.

Non-Diagnostic Information and Control Deviations

Control deviations can occur for IT controls or manual controls. Further, the human-computer interaction literature indicates that (1) the technology element associated with IT controls provides non-diagnostic information that will dilute perceived management blame for control deviations; and (2) auditors will not ignore this non-diagnostic technology information. Following theory on persuasion tactics, we expect that non-diagnostic technology information will dilute perceived management blame and make concession, but not denial, an effective persuasion tactic.

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[4] Prior research finds that auditors discount explanations that are congruent with management incentives because they are suspicious that the manager is more likely to provide self-serving information that does not reflect their true beliefs about the underlying facts (Anderson et al. 2004; King 2002; Hirst 1994).

An IT control deviation contains both technological and human elements, whereas a manual control deviation contains only human elements (AICPA 2006).[5] The technological element of an IT control is highly reliable when properly designed, implemented, and protected from improper change (Jackson 2007). It is the human element of properly designed and implemented IT controls that can fail and create deviations (Jackson 2007; Gansler and Lucyshyn 2005). Therefore, the technology element in an IT control deviation can become irrelevant, non-diagnostic information when the root cause of the deviation is failure of the human element.

We predict that the irrelevant, non-diagnostic technology element in an IT control deviation explanation will dilute perceived management blame. Our expectation is based on psychological responses to technology. The human-computer interaction literature indicates that people behave as if computers warrant human treatment and are able to participate in social interaction, including the assignment of blame (Kelton et al. 2008; Sundar and Nass 2000). Nissenbaum (1994) concludes that when technology is involved in a failure event, human failure is underestimated.[6] Further, research indicates that organizations are held less accountable for technology failure because technology failure is considered less discretionary than human failure (Naquin and Kurtzberg 2004; Gansler and Lucyshyn 2005). Based on psychological response to human-computer interaction, we expect that the technology element of an IT control deviation will dilute perceived management blame.

In sum, we expect that an IT control deviation explanation provides non-diagnostic information that dilutes perceived management blame, reducing the cost of concession, and making concession a relatively effective persuasion tactic. Concession is not expected to be an effective persuasion tactic for manual control deviations because non-diagnostic information that dilutes management blame is absent and human failure stands alone as manual control deviations rest solely with management. With respect to denial, we expect that non-diagnostic information is not powerful enough to reverse the evidence of an observed control deviation or undo the signal of violating AS No. 5 requirements. Therefore, denial is not expected to be an effective persuasion tactic for either IT or manual control deviations. Accordingly, we hypothesize:

> **H1:** In the presence of IT control deviations, auditors assess the significance of deficiency lower when management uses concessions rather than denials, but in the presence of manual control deviations, auditors assess the significance of deficiency no differently when management uses concessions or denials.

To provide further evidence on the underlying judgment process, we also examine auditor judgment of management's explanation adequacy. Prior research finds that an explanation's perceived adequacy, as opposed to the explanation's claim in and of itself, is the primary factor that influences judgment (Bies et al. 1988; Shapiro et al. 1994; Hareli 2005). Therefore, persuasion tactics must first increase explanation adequacy before they can effectively change subsequent judgments (Bies and Shapiro 1987; Barton and Mercer 2005). We expect that the costs and benefits of concessions and denials, as well as the relative dilution effects of non-diagnostic information, will follow the above discussion for explanation adequacy. Accordingly, we test the following second hypothesis:

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[5] For example, IT security controls include programmed access controls (technological) and employee choice and protection of passwords (manual).

[6] While it appears inappropriate for people to relate socially to inanimate computer technology (Kelton et al. 2008; Nissenbaum 1994), research supports a social relationship between humans and computers whereby humans attribute to computers (and not to other inanimate objects) an array of mental properties, such as intention and preference, which result in assignment of blame (Kelton et al. 2008; Sundar and Nass 2000; Nissenbaum 1994).

> **H2:** In the presence of IT control deviations, auditors perceive the adequacy of explanation higher when management uses concessions rather than denials, but in the presence of manual control deviations, auditors perceive the adequacy of explanation no differently when management uses concessions or denials.

III. RESEARCH METHOD AND PARTICIPANTS

Experimental Task and Materials

We conducted an experiment in which audit seniors read a case and then evaluated two internal control deviations. Materials consisted of background information about a manufacturing company, summary financial statements, a narrative description of the revenue-transaction processing cycle, information concerning auditor-identified control deviations, and a conversational vignette between an auditor and a client manager. Auditors assessed the severity of deficiency for potential significant deficiencies arising from control deviations. All deviations were designed such that they could have potentially contributed to a more than inconsequential misstatement of the financial statements and the root cause was employee failure to follow procedures.

In the IT control deviation treatment, one deviation involved a password policy violation resulting in placement of false sales orders from a stolen laptop (IT-1). The other involved a system breach in which an employee wrongly provided access to an intruder who stole customer procurement card information (IT-2). In the manual control deviation treatment, one deviation involved inappropriate credit-approval overrides (Manual-1) and the other involved unrecorded discounts on sales (Manual-2). Two forms of deviation were used in each treatment to guard against idiosyncrasies in a particular form of control deviation.

The conversational vignette in each experimental treatment took place between the audit senior and the client's controller. In the vignette, the controller explained the control deviations. In the concession (denial) treatment, the controller concedes (denies) that there was an operating effectiveness breakdown with respect to each control deviation. Importantly, in neither the concession nor the denial treatment did the controller offer to make any changes to internal control procedures, and in each treatment, the controller indicated that management is very concerned with maintaining strong internal control and that "nothing has occurred that caused a material misstatement of profits." See the Appendix for an excerpt of the experimental materials.

We randomly assigned participants to either the IT or manual control deviation treatment and to either the concession or denial treatment. Within treatments, we counterbalanced the order of the two cases. Experimental administrators read a script introducing the experiment and distributed envelopes containing an information sheet, general instructions, background questions, and experimental task materials. Administrators monitored completion of the task and collected the instruments. The experiment took about one hour to complete.

Variables

The manipulated independent factors are coded dichotomously as: type of persuasion tactic (concession or denial), type of control deviation (IT or manual), and control deviation case (first or second). All other variables were measured on 11-point scales. Dependent variables are the assessed significance of deficiency, anchored on "no deficiency" and "significant deficiency," and the perceived explanation adequacy, anchored on "not adequate" and "very adequate." To test our underlying theory, we also captured the blame auditors assigned to management for each control deviation, anchored on "no blame" and "all blame." Control variables for each internal control deviation follow professional guidance in AS No. 5 regarding the assessment of control deficiency. We captured perceptions of the likelihood of misstatement, anchored on "remote" and "probable," potential magnitude of misstatement, anchored on "inconsequential" and "material," and the efficacy of compensating controls, anchored on "negatively influenced" to "positively influenced."[7]

Participants

Audit seniors from a Big 4 firm attending a national training session served as participants. Four participants are dropped due to incomplete responses, so our final sample consists of 106 auditors. Table 1, Panel A presents a profile of the auditors' experiential backgrounds. The auditors in our study have an average of about three years of experience; most have been trained on SOX 404 and AS No. 2 (89.62 percent); and most have been involved in SOX 404 audits (86.79 percent).[8] Table 1, Panel B presents an evaluation of the auditors' understanding of the experimental control deviation cases. The results indicate the auditors understood each control deviation in the experimental materials, rating average understandability between 8.68 and 9.46 on an 11-point scale. Further, participants appear to have understood the link between control deviations and financial reporting risk, as required by AS No. 5 (PCAOB 2007, para. 3). Auditors rated consideration of risk to financial statements for the control deviations between 7.93 and 8.78 on an 11-point scale. Based on Chi-square and ANOVA testing, we find that the experience and control deviation evaluation metrics are not significantly different across treatments ($p > 0.10$), with the exception of months of audit experience ($p = 0.02$).[9] In untabulated results, each of the experience and control deviation evaluation metrics was included as a covariate in each of the multivariate data analyses presented. None were statistically significant or had a substantive effect on the reported results.

Experimental Checks

To ensure that the internal control deviations and dialog were realistic and representative of practice, experimental materials were reviewed by two audit managers (from a Big 4 firm not providing participants), a former Big 4 audit partner, the controller of a publicly traded firm, and they were pilot-tested on audit seniors from several different firms. The final versions of the experimental materials were reviewed by a partner and manager from the firm that provided participants to ensure that terminology was consistent with firm terminology and to ensure that the experimental task was appropriate for the firms' audit seniors. While these reviewers noted that final determination of internal control deficiencies is made at a higher level than senior auditor, they also indicated that control issues are first analyzed by the engagement audit senior and they consider these initial evaluations of internal control deviations to be vital to the audit.

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[7] The 11-point scale on the compensating controls question ranged from -5 to 5, because it encompassed both negative and positive perceptions. Analyses of likelihood and magnitude of misstatement scales indicate responses consistent with the assessment of significant deficiency.

[8] We solicited demographics on AS No. 2 because the experiment was run previous to the implementation of AS No. 5.

[9] Five auditors reported audit experience of 90 to 120 months. If we consider them outliers and drop them from our analyses, then months of audit experience is no longer significantly different across treatment conditions ($p = 0.177$). Statistical analyses excluding these auditors produce results substantially identical to those reported. They are, therefore, left in the sample.

TABLE 1
Profile of Auditors' Experience and Control Deviation Understanding

Panel A: Experience

	Number	Percent
Number of Auditor Participants	106.00	100.00
Number of Auditor Participants With		
In-Charge Experience	92.00	86.79
In-Charge Experience SOX 404 Controls Audit	57.00	53.77
Involvement in SOX 404 Audit	92.00	86.79
Training on SOX 404	95.00	89.62
Training on AS No. 2	95.00	89.62
	Mean	**Std. Dev.**
Auditor Participants Average		
Months of Audit Experience	37.62	19.78
Number of Clients with SOX 404 audits	1.52	1.03
Number of Clients with systems group interactions	2.16	1.25
Number of Clients with significant deficiencies	0.90	0.82
Number of Clients with material weaknesses	0.33	0.57

Panel B: Control Deviation Understanding[a]

	Mean	Std. Dev.
Understood Control Deviation[b]		
IT-1: Password Policy Violation—Invalid Sales Invoices	9.00	1.86
IT-2: Wrongly Granting System Access—Stolen Procurement Cards	8.68	1.73
Manual-1: Unapproved Customer Credit	9.46	1.59
Manual-2: Unrecorded Sales Discounts	9.13	1.84
Consideration of Financial Statement Risk from Control Deviation[b]		
IT-1: Password Policy Violation—Invalid Sales Invoices	7.93	2.42
IT-2: Wrongly Granting System Access—Stolen Procurement Cards	8.78	2.01
Manual-1: Unapproved Customer Credit	8.50	1.94
Manual-2: Unrecorded Sales Discounts	8.73	1.44

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[a] Each deviation case was designed to be understandable, potentially have contributed to a more than inconsequential misstatement of the financial statements, and have its cause rooted in employee failure to follow procedures. IT-1 and IT-2 represent the IT control deviation cases. The first deviation case involved placement of false sales orders using a password obtained from a stolen laptop where the employee had permanently stored their system password. The second deviation case involved a system access violation where the employee had provided access to an intruder who stole customer procurement card information. In the manual control deviations, the first deviation case, Manual-1, involved inappropriate credit approval overrides and the second deviation case, Manual-2, involved unrecorded discounts on sales. (See the Appendix for an excerpt of the experimental materials that describes the control deviations.)

[b] Assessments were made on 11-point scales with 11 representing high understandability and high consideration of financial statement risk.

Manipulation checks (measured with 11-point scales) were included to verify that participants read and understood the treatments. One question asked about the tone of the explanations given by the controller and was anchored on "admitting there was a breach of control" and "denying there was a breach of control." The mean responses of participants in the concession (denial) treatment are 4.51 (9.98) and 4.71 (9.78) for the two internal control deviations. Another question asked when the control deviation was discovered and was anchored on "while testing revenue cycle application controls" and "while testing information technology general controls." The mean responses of participants in the IT (manual) control deviation treatment are 8.59 (3.07) and 8.85 (2.50) for the two internal control deviations. All differences between treatments are statistically significant ($p < 0.01$) and indicate that participants understood their assigned type of persuasion tactic and control deviation. Finally, all participant responses were captured under two different question orders, with no order effects detected.

IV. RESULTS

Table 2 presents t-tests of mean differences between concession and denial treatments for the dependent and control variables. With respect to IT control deviations, the assessed significance of deficiency (H1) is lower for concession than denial for IT-1 (5.74 versus 7.30; $p = 0.028$) and IT-2 (8.00 versus 9.26; $p = 0.042$).[10] In addition, perceived explanation adequacy (H2) is higher for concession than denial for IT-1 (6.22 versus 4.22; $p < 0.001$) and IT-2 (6.19 versus 3.41; $p < 0.001$). With respect to manual control deviations, the assessed significance of deficiency and perceived explanation adequacy do not differ between concession and denial ($p > 0.10$) for Manual-1 or Manual-2. Thus, univariate results are consistent with H1 and H2.

Table 3 presents multivariate tests of H1 and H2 using repeated measures ANOVA models. The results indicate a significant interaction between the concession/denial and IT/manual treatments for the assessed significance of deficiency ($p = 0.038$) and perceived explanation adequacy ($p = 0.004$).[11] Figure 1 presents graphs of each interaction and Table 3, Panel B presents mean contrasts of concession/denial within IT and manual treatments. For IT control deviations, the assessed significance of deficiency is lower for concessions than denials ($p = 0.007$) and perceived explanation adequacy is higher for concessions than denials ($p < 0.001$). For manual control deviations, the assessed significance of deficiency and perceived explanation adequacy are not significantly different for concessions and denials ($p > 0.50$ for both tests).[12] Our multivariate results are also consistent with H1 and H2.

While our results indicate systematic differences in the effectiveness of concessions and denials between IT and manual control deviations, alternative explanations exist for the observed differences. Specifically, the IT control deviations could systematically differ from the manual control deviations in perceived plausibility or significance.[13] As shown in Table 4, differences in auditor perception and judgment are evident across IT and manual control deviation cases. Specifically, IT-1 exhibits a lower assessed significance of deficiency and a higher perceived explanation adequacy than do either of the manual control deviations (Manual-1 or Manual-2). However, IT-2 does not systematically differ from the manual control deviations (Manual-1 or Manual-2) in perceived plausibility or significance, and we find no evidence that concessions are only effective for IT-1. The t-tests in Table 2 indicate systematic differences between concessions and denials for IT-2. As well, untabulated repeated measures ANOVAs on IT control deviations corroborate these results.

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[10] All reported p-values are two-tailed.

[11] We also analyze the within-subjects interactions reported in Table 3. While we find differences across the cases (IT-1, IT-2, Manual-1, Manual-2), we find no evidence that between subject concession and denial results are a function of only one of the IT cases or one of the manual cases.

[12] IT concessions have lower deficiency assessment ($p = 0.001$) and higher perceived explanation adequacy ($p < 0.001$) than the average of the other treatments ($\mu_{IT/Concede}$ versus $(\mu_{IT/Deny} + \mu_{Manual/Concede} + \mu_{Manual/Deny})/3$). IT denials do not differ in deficiency assessment ($p > 0.50$) or perceived explanation adequacy ($p > 0.50$) as compared to the average of manual concession and denial ($\mu_{IT/Deny}$ versus $(\mu_{Manual/Concede} + \mu_{Manual/Deny})/2$).

[13] The comparison of IT and manual control deviations require the comparison of different deviation cases.

TABLE 2
Auditor Judgment Differences between Concession and Denial Persuasion Tactics

	IT Control Deviations						Manual Control Deviations					
	IT-1 Password Policy Violation			IT-2 Wrongly Granting Access			Manual-1 Unapproved Credit			Manual-2 Unrecorded Discounts		
Variables[a]	**Concede**	**Deny**	**t-value**	**Concede**	**Deny**	**t-value**	**Concede**	**Deny**	**t-value**	**Concede**	**Deny**	**t-value**
	n = 27	n = 27		n = 27	n = 26/27[b]		n = 27/28[b]	n = 24		n = 27/28[b]	n = 24	
Significance of Deficiency	5.74	7.30	2.280**	8.00	9.26	2.080**	8.54	8.58	0.083	8.43	8.13	0.579
	(2.58)	(2.43)		(2.63)	(1.72)		(2.03)	(2.08)		(1.83)	(1.94)	
Explanation Adequacy	6.22	4.22	3.343***	6.19	3.41	4.441***	4.26	3.79	0.655	3.14	3.58	0.663
	(2.21)	(2.19)		(2.48)	(2.10)		(2.80)	(2.23)		(2.09)	(2.70)	
Compensating Controls	0.26	−0.37	1.147	−1.04	−1.48	0.817	−0.71	−1.63	1.542	−0.96	−0.96	0.010
	(1.99)	(2.04)		(1.93)	(2.06)		(1.88)	(2.37)		(1.75)	(2.53)	
Magnitude of Misstatement	6.63	8.33	2.191**	8.04	9.23	1.856*	8.14	7.92	0.392	7.68	7.79	0.187
	(2.93)	(2.59)		(2.58)	(2.07)		(2.05)	(2.10)		(2.06)	(2.30)	
Likelihood of Misstatement	6.96	7.26	0.383	7.11	8.30	1.856*	7.68	8.13	0.668	8.04	8.29	0.458
	(2.93)	(2.75)		(2.01)	(2.64)		(2.57)	(2.19)		(2.06)	(2.37)	

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*, **, *** Denotes two-tailed significance at the 10 percent, 5 percent, 1 percent levels, respectively. Mean (Std. Dev.) and t-values reported.

[a] All variables captured with 11-point scales. Significance of Deficiency anchored by "no deficiency" and "significant deficiency"; Explanation Adequacy anchored by "not adequate" and "very adequate"; Compensating Controls anchored by "negatively influenced" and "positively influenced" (scale ranged from −5 to 5); Magnitude of Misstatement anchored by "inconsequential" and "material"; and Likelihood of Misstatement anchored by "remote" and "probable."

[b] Cell sizes vary due to two missing responses: one in Explanation Adequacy and one in Magnitude of Misstatement.

TABLE 3
Repeated Measure ANOVAs and Mean Contrasts

Panel A: Repeated Measures ANOVA[a]

		Significance of Deficiency (H1)			Explanation Adequacy (H2)		
Source of Variation	**df**	**MS**	**F**	**p**	**MS**	**F**	**p**
Between Subjects							
IT/Manual	1	37.633	5.332	0.023	87.834	10.554	0.002
Concession/Denial	1	21.616	3.063	0.083	78.074	9.381	0.003
IT/Manual × Concession/Denial	1	31.130	4.411	0.038	71.414	8.581	0.004
Error	102/101	7.058			8.323		
Within Subjects							
Case	1	44.144	17.840	0.000	14.395	5.138	0.026
Case × IT/Manual	1	75.373	30.582	0.000	0.507	0.181	0.672
Case × Concession/Denial	1	1.384	0.559	0.456	0.008	0.003	0.956
Case × IT/Manual × Concession/Denial	1	0.010	0.004	0.950	8.446	3.015	0.086
Error(Case)	102/101	2.474			2.802		

Panel B: Mean Contrasts

		Significance of Deficiency (H1)		Explanation Adequacy (H2)	
Hypotheses	**Mean Contrasts**	**Contrast Value**	**t-value**	**Contrast Value**	**t-value**
H1/H2	$\mu_{IT/Concede}$ versus $\mu_{IT/Deny}$	−1.407	2.753***	2.389	4.305***
	$\mu_{Manual/Concede}$ versus $\mu_{Manual/Deny}$	0.128	0.245	−0.053	0.093

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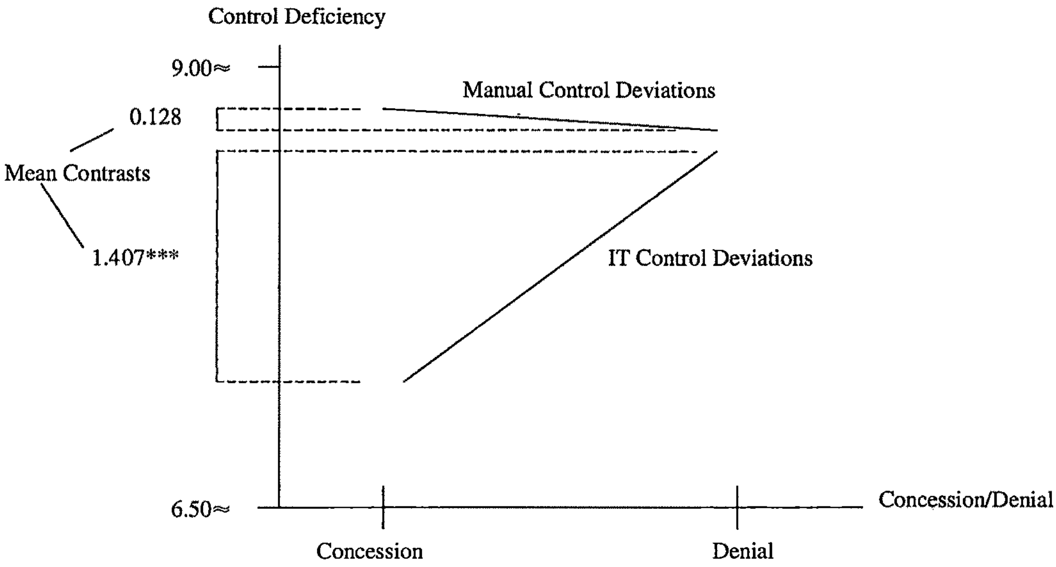
*, **, *** Denotes two-tailed significance at the 10 percent, 5 percent, 1 percent levels, respectively.

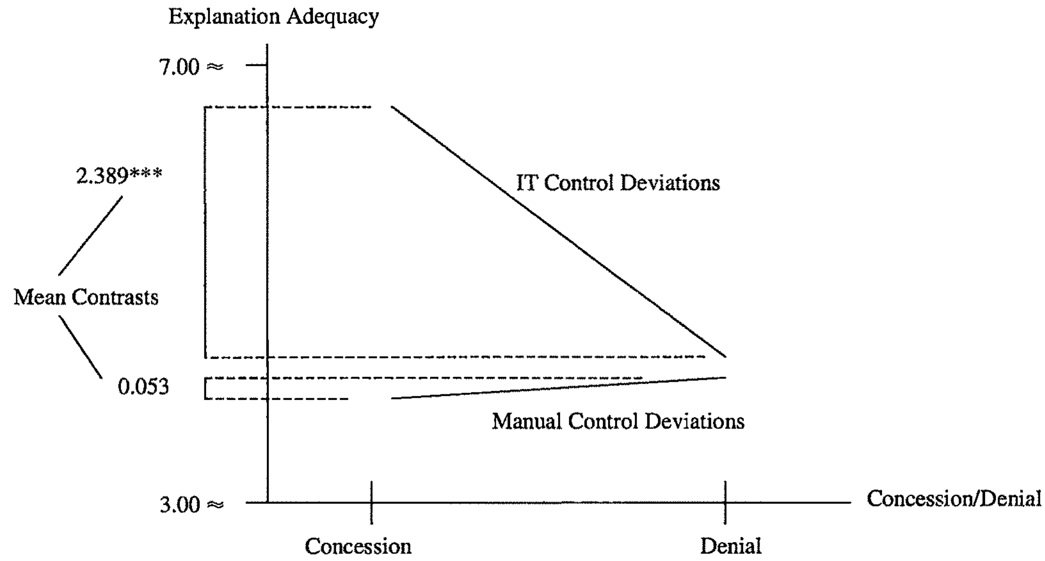
[a] Significance of Deficiency and Explanation Adequacy are defined in Table 2. Participants evaluated two control deviations (Case) consisting of either IT or manual control deviations (IT/Manual) and participants received management explanations for the deviations that either contained concession or denial (Concession/Denial) that the deviation represented a deficiency. Greenhouse-Geisser and Huynh-Feldt adjustment to degrees of freedom for sphericity violations validate the reported repeated measure results (Tabachnick and Fidell 2000). For sensitivity analysis, regressions using Huber-White corrected standard errors were run and these produced results inferentially identical to those reported (Stata Press 2005). Results from a repeated measures multivariate analysis of variance (RMANOVA) were inferentially identical to those reported in the individual repeated measure ANOVAs.

FIGURE 1
Interaction Graphs of Concession/Denial Persuasion Tactics and IT/Manual Control Deviations

Panel A: Assessed Significance of Deficiency



Panel B: Perceived Explanation Adequacy



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*, **, *** Denotes two-tailed significance at the 10 percent, 5 percent, 1 percent levels, respectively.

In sum, we find no evidence that concessions and denials are differentially effective due to differences in perceived plausibility or significance across the IT and manual control deviation cases.

TABLE 4
Auditor Judgment Differences between IT and Manual Control Deviation Cases

Panel A: Mean (Std. Dev.) of IT and Manual Control Deviation Cases

	Control Deviation Cases[a]				
Variables[b]	**IT-1**	**IT-2**	**Manual-1**	**Manual-2**	**F-value[c]**
	n = 54	n = 53/54	n = 51/52	n = 51/52	
Significance of Deficiency	6.52	8.63	8.56	8.29	10.823***
	(2.60)	(2.29)	(2.03)	(1.87)	
Explanation Adequacy	5.22	4.80	4.04	3.35	5.828***
	(2.40)	(2.67)	(2.53)	(2.38)	
Compensating Controls	−0.06	−1.26	−1.13	−0.96	3.725**
	(2.02)	(1.99)	(2.15)	(2.12)	
Magnitude of Misstatement	7.48	8.62	8.04	7.73	2.198*
	(2.96)	(2.40)	(2.06)	(2.15)	
Likelihood of Misstatement	7.11	7.70	7.88	8.15	1.772
	(2.82)	(2.40)	(2.39)	(1.99)	

Panel B: Mean Differences between IT and Manual Control Deviation Cases

		Variables[d]			
Control Deviations		**Significance of Deficiency**	**Explanation Adequacy**	**Compensating Controls**	**Misstatement Magnitude**
IT-1	IT-2	−2.11***	0.42	1.20**	−1.14*
	Manual-1	−2.04***	1.18*	1.07**	−0.56
	Manual-2	−1.77***	1.87***	0.90	−0.25
IT-2	Manual-1	0.07	0.76	−0.13	0.58
	Manual-2	0.34	1.45***	−0.30	0.89
Manual-1	Manual-2	0.27	0.69	−0.17	0.31

*, **, *** Denotes two-tailed significance at the 10 percent, 5 percent, 1 percent levels, respectively.

[a] IT-1 refers to the password policy violation case; IT-2 refers to the wrongly granting access case; Manual-1 refers to the unapproved credit case; and Manual-2 refers to the unrecorded discounts case.

[b] All variables are defined in Table 2. Cell sizes vary due to the two missing responses noted in Table 2.

[c] A multivariate analysis of variance (MANOVA) indicates statistically significant differences between control deviation cases (Pillai's Trace = 0.339; $p < .01$). Individual ANOVA F-values are shown.

[d] Values shown are mean differences. Bonferroni mean comparisons are used to determine statistical significance. Tukey honestly significant differences produce results identical to the Bonferroni method.

Additional Analyses

Management Blame

Theory suggests that the technology element in an IT control deviation explanation will dilute management blame. As shown by t-tests in Table 5, Panel A, auditors perceive management blame significantly lower for IT than for manual control deviations.[14] We theorize that reduced management blame will make concession, but not denial, an effective persuasion tactic. As shown in Table 5, Panel B, when auditors perceive management blame low, concessions result in lower assessed significance of deficiency (6.65 versus 7.42; p

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[14] For sensitivity, we perform repeated measures ANOVA and regression with Huber-White corrected standard errors (Stata Press 2005) that controlled for perceived deviation significance. All results indicate that perceived management blame is higher for IT than manual deviations and is unaffected by concessions and denials.

TABLE 5
Management Blame for Control Deviations

Panel A: Means (Std. Dev.) Management Blame[a]

Control Deviation Comparisons	Control Deviations: IT	Control Deviations: Manual	t-value
(IT-1 versus Manual-1)	6.04 (2.56)	9.60 (1.49)	8.725***
(IT-1 versus Manual-2)	6.04 (2.56)	8.87 (1.77)	6.600***
(IT-2 versus Manual-1)	8.07 (2.14)	9.60 (1.49)	4.245***
(IT-2 versus Manual-2)	8.07 (2.14)	8.87 (1.77)	2.072**

Panel B: Concession and Denial by Management Blame

	Control Deviations					
	Low Management Blame[c]			High Management Blame[c]		
Variables[b]	Concede	Deny	t-value	Concede	Deny	t-value
	n = 60	n = 48		n = 50	n = 54	
Significance of Deficiency (median split)	6.65 (2.54)	7.42 (2.20)	1.654*	8.94 (1.878)	9.26 (1.72)	0.475
Explanation Adequacy (median split)	6.00 (2.38)	4.29 (2.20)	3.832***	3.63 (2.55)	3.25 (2.29)	0.745

*, **, *** Denotes two-tailed significance at the 10 percent, 5 percent, 1 percent levels, respectively.

[a] Management Blame was captured with an 11-point scale anchored by "no blame" and "all blame." IT-1 refers to the password policy violation case; IT-2 refers to the wrongly granting access case; Manual-1 refers to the unapproved credit case; and Manual-2 refers to the unrecorded discounts case.

[b] Variables are defined in Table 2.

[c] The median split is based upon blame assessed below 9 (low blame) and above 8 (high blame) on an 11-point scale. The low (high) management blame cohort contain 76 (32) and 32 (72) IT and manual control deviation cases, respectively.

= 0.100) and higher perceived explanation adequacy (6.00 versus 4.29; $p < 0.001$) than denials.[15] When auditors perceive management blame high, concessions and denials have no differential effect on the assessed significance of deficiency (8.94 versus 9.26; $p > 0.50$) or perceived explanation adequacy (3.63 versus 3.25; $p = 0.458$). These results support theory that perceived management blame is lower for IT control deviations and that lower blame makes concession a more effective persuasion tactic.

Process Model of Persuasion Tactic Effects

We show that persuasion tactics can influence auditor-assessed significance of deficiency. However, theory and professional guidance provide expected interventions to this relation. First, theory indicates that an explanation's perceived adequacy, as opposed to its claim, influences judgment (Bies et al. 1988; Shapiro et al. 1994); therefore, perceived explanation adequacy should mediate the influence of persuasion tactics on the assessed significance of deficiency. Second, AS No. 5 establishes perceived magnitude of misstatement, likelihood of misstatement, and effectiveness of compensating controls as statutory determinants of deficiency severity (PCAOB 2007, paras. 62–68). We perform path analyses to test the relations among concession/denial, explanation adequacy, the statutory determinants of deficiency severity, and auditor-assessed significance of deficiency.

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[15] Reported results are for a median split on management blame. As expected, 70 (30) percent of observations in the low management blame group are IT (manual) control deviations. For sensitivity analysis, we also made more extreme cuts on blame. Results are inferentially identical to those reported.

Individual path models for IT and manual control deviations are shown in Figure 2.[16] Both models contain all statistically significant paths and both models have good fit (comparative fit index (CFI) > 0.96 and the standardized root mean square residual (SRMR) < 0.057) (Kline 2005). As expected, our models indicate that explanation adequacy fully mediates the effect of concession/denial on the assessed significance of deficiency and that estimated magnitude and likelihood of misstatement affect the assessed significance of deficiency.[17] We also find that perceived explanation adequacy has a strong inverse relation with auditor-assessed significance of deficiency for both IT and manual control deviations. This finding implies that anything management can do to make explanations appear more adequate will result in auditor judgments that are more aligned with management's preferences.

V. DISCUSSION

Explanations are given to persuade others that one's actions are sensible and appropriate (Keil 2006). Prior research in accounting finds that management makes self-serving explanations in annual reports (Bettman and Weitz 1983; Aerts 2005; Barton and Mercer 2005) and to auditors when defending their position related to earnings management attempts (Nelson et al. 2002). The literature also indicates that auditors are less persuaded by self-serving explanations when management has incentives to manage earnings (Anderson et al. 2004) and that only plausible explanations for unfavorable outcomes persuade analysts (Barton and Mercer 2005). We extend this literature by holding incentives and factual content constant to study the effect of concession and denial persuasion tactics embedded in management's explanations to auditors.

When management concedes that an IT control deviation reflects a control failure, we find that auditors assess significance of deficiency lower and perceived explanation adequacy higher than when management denies the existence of control failure. However, we find no difference in auditor-assessed significance of deficiency or perceived explanation adequacy for manual control deviations, irrespective of whether management concedes or denies a control failure. Consistent with theory, we find that auditors blame management less for IT than manual control deviations, and we find that the relative effectiveness of concessions and denials can be explained by the amount of blame assigned to management. More generally, our results indicate that concessions are more effective persuasion tactics than denials whenever a concession is joined with information that reduces auditor perception of management blame. While IT control deviations provide a natural and commonly occurring context for this phenomenon, future research should study other contexts in which management persuasion tactics are combined with information that influences auditor perception of management blame.

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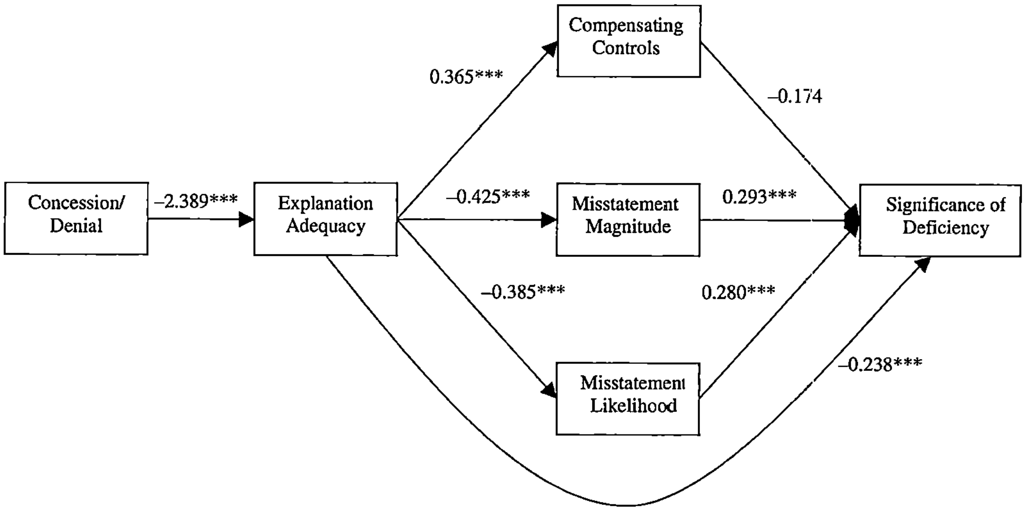
[16] We separately identify the path models in order to estimate indirect path effects, which we report in the notes for Figure 2. However, we also perform a multi-group SEM analysis that simultaneously identifies the IT and manual path models. The multi-group analysis produces results inferentially identical to those reported.

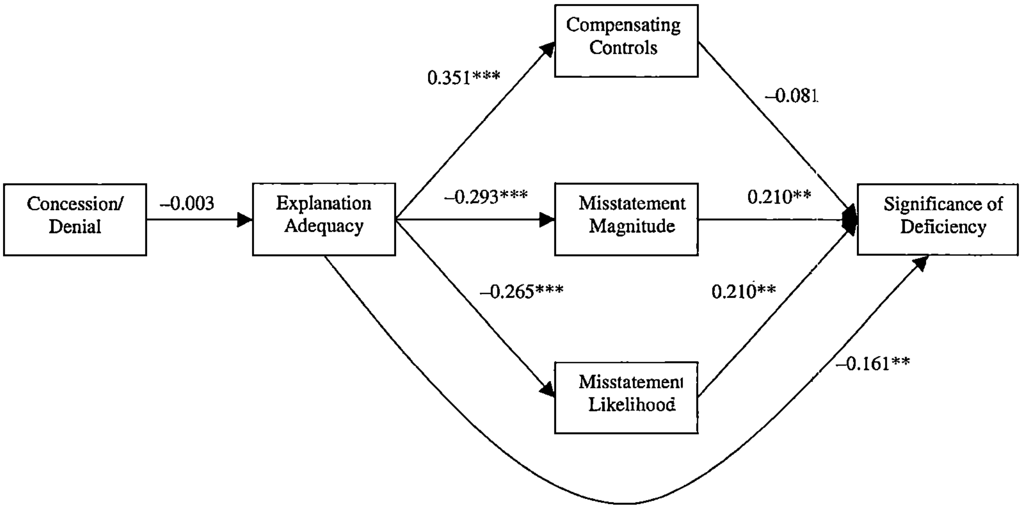
[17] A mediation test based on only concession/denial, explanation adequacy, and deficiency assessment also indicates that explanation adequacy fully mediates concession/denial effects on the assessed significance of deficiency (Baron and Kenny 1986).

FIGURE 2
Path Models

Panel A: IT Control Deviations[a]



Panel B: Manual Control Deviations[a]



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*, **, *** Denotes two-tailed significance at the 10 percent, 5 percent, 1 percent levels, respectively.

[a] Modeled, but not shown, is a statistically significant, positive covariance between misstatement magnitude and likelihood judgments (Pearson correlation; $\rho = 0.587$; $p < .001$). All alternative paths stemming from concession/denial were tested and were found statistically insignificant—explanation adequacy fully mediates the effects of concession/denial persuasion tactics for IT control deviations. Path models are estimated based on covariance matrices, and indicate good fit with the comparative fit index (CFI) $> .96$ and the standardized root mean square residual (SRMR) < 0.057 for both models (Kline 2005). Significant indirect effects stemming from concession/denial are only found in the path model for IT control deviations. Indirect path parameter estimates and their t-values are as follows: (1) concession/denial => explanation adequacy => control deficiency (0.568, $t = 2.481$**); (2) concession/denial => explanation adequacy => magnitude of misstatement => control deficiency (0.297, $t = 2.402$**); and (3) concession/denial => explanation adequacy => likelihood of misstatement => control deficiency (0.258, $t = 2.261$**).

The audit planning materials used in this experiment are contextually rich, but they are necessarily restricted due to limits on access to the experimental participants and potential maturity effects. We study deviations indicative of potential significant deficiencies. While significant deficiencies are important, they are less severe than material weaknesses, and our results may not generalize to deviations indicative of potential material weaknesses. Our experimental cases differed on attributes other than the presence and absence of technology in control deviations, because of the nature of our experiment's internal control setting. Although analyses of alternative explanations for our results do not contradict our interpretation of the interaction effect between persuasion tactics and IT/manual control deviations, we cannot rule out the possibility that unobserved correlated variables could offer alternative explanations for our results. In addition, our results may not generalize to all types of control deviations. For instance, control deviations defined as design deficiencies typically do not involve operational testing, and it is not clear whether management persuasion tactics would influence auditors differently for design versus operational control deficiencies. Future research is needed to address these issues.

Our results are specific to audit seniors and potentially specific to the firm that provided the participants. Also, audits usually involve an audit team, and the ability to interact with other team members can affect audit judgments. In this experiment, we used individual judgments that do not capture dynamic team interactions. However, the initial judgments made and documented by audit seniors have been shown to influence the judgments of reviewing auditors (Ricchiute 1999). Further, the audit seniors in this study were experienced in evaluating control deviations and firm partners indicated that audit senior judgments are important to the audit. Our focus on individual judgments is consistent with prior research in audit judgment and decision-making.

SOX requirements have significantly expanded audits of publicly traded firms and thereby created a new environment for the auditor that involves making judgments on the quality of clients' internal control systems. The subjective nature of this judgment provides the vehicle for management persuasion tactics to influence auditors. For regulators, our results indicate that auditors can be influenced by management persuasion tactics. In addition, we find that perceived explanation adequacy exerts a strong effect on auditor judgment regardless of control deviation type. This result is important because it suggests that management inquiry does more than provide auditors with factual evidence, per professional guidance in AS No. 5. With regard to audit practice, our results indicate that a consistent use of concessions by management is an optimal strategy, because concessions are not perceived negatively by auditors and sometimes they produce auditor judgments that are significantly more favorable to management's agenda. This represents a potential bias in auditor judgment that firms could consider addressing in training.

We extend the management explanation literature to consider explanations that embody persuasion tactics, as opposed to explanations solely for the purpose of offering causal evidence germane to the audit. In addition, we demonstrate an interaction effect between type of persuasion tactic and type of control deviation and provide evidence about how persuasion tactics influence auditors' assessments. By integrating prior research on the dilution effect (Hackenbrack 1992) with psychology-based theory on persuasion tactics and human-computer interactions, we provide a more complete understanding of the complex relation between management explanations and auditor judgment.

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APPENDIX
EXPERIMENTAL MATERIALS: INTERNAL CONTROL DEVIATIONS AND CONVERSATIONAL VIGNETTE

IT Control Deviations

Specific Issues determined in testing information technology general controls:

1. A salesperson's laptop had been stolen. It contained a stored password that allowed a sales order to be downloaded to the system. Several bogus orders had been placed before the password was disabled.
2. Griffin's system had been breached in November. Indications are that approximately 2,000 customer records were stolen from the customer master file. Much of the information lost was harmless. However, some of it would be of value to competitors. Additionally, approximately 500 of the customers had procurement card information on file.

IT Control Deviations Conversational Vignette

The audit senior on the engagement, John, follows up on these issues with Derrick, the controller of Griffin Inc. The following is the discussion between John and Derrick.[18]

> **John:** Hi Derrick. I scheduled this meeting with you to discuss some findings related to our controls audit. First, I'd like to discuss salesperson access to your sales order system.
> **Derrick:** Sit down, John. I'd be happy to discuss that with you. Our salespeople work primarily from the field. So, we have provided them with laptops and that allows them to create sales orders and electronically file them from the field. Of course, both the laptops and our order entry system are password protected. What else can I tell you?
> **John:** Well, I am familiar with the access controls that you just described; however, when we were performing our tests over information technology general controls, we reviewed password changes and found a cancelled password that we were told was due to a laptop theft. Apparently one of your salespeople lost their laptop and it contained the password for your order entry system?
> **Derrick:** *John, I admit that we did have a small breach of controls in access.* (*John, this was not a control breach. This was an unusual incident due to circumstances beyond our control.*) The laptops themselves are password protected, but once that laptop is in the hands of a hacker, the laptop's password is almost useless. In this particular instance, our salesperson had permanently stored their system password on their laptop. So, once the thief had the laptop, they basically had access to our order entry system. Now, that said, as soon as the laptop was reported stolen, we disabled that password. Additionally, our credit manager reviews sales orders and if the order is to a new customer, he catches it. *John, I concede that we had a breach of a system access control, but as I said, our credit manager reviews sales orders.* (*John, people steal. We have controls that limit the damage from theft, but we cannot stop theft. This is not in our power. This is not a breach of controls.*)
> **John:** Did any invalid sales orders get through?
> **Derrick:** Frankly, we did ship a very large order to one of our customers. Although they could have denied it, the order happened to be for product they normally carry so they accepted the order after they reported it. If those amounts hadn't been paid, that

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[18] Italicized text represents the concession manipulation. Italicized text in parenthesis represents the denial manipulation.

could have affected our results for this year. But, the important point is that the account was paid.

John: OK, let's get to the next issue. It appears that your main servers were hacked in November. Additionally, we found evidence that the customer master file was breached.

Derrick: *Again, John, I have to admit that security was breached. (Again, John, this was not a control breach. This system breach was due to circumstances beyond our control.)* It looks like we were socially engineered. Someone began attacking our system. Of course, our firewall picked it up. Then one of our system administrators got a phone call, and the caller said that our system was attacking his system. Our administrator said he didn't think that was the case and that we were being attacked also. In any event, the two decided that they would work on this problem together, and our administrator gave the caller access to part of our system. Well, the caller was the hacker and he used his access to our system to breach the customer master file. As you know, he got about 500 procurement card numbers. Luckily, the liability on those is limited. (*John, how do you protect yourself against something like this? Bad guys are constantly trying to break into our system. We cannot control that. One of them just got through this time.*) And do not forget, John, we trained our people against this type of threat.

John: How quickly did you discover the breach?

Derrick: You know, John, that's the insidious thing. When one of our employees lets hackers into our system, we do not have any mechanism to catch them. If we do not stop them at the gate, it's trouble. We didn't know that our system had been breached until the pro-cards started getting charged fraudulently, and it eventually led back to our shop.

John: Is there any possibility of an unrecorded liability here?

Derrick: No, I do not think so, John. It could have been larger, but we caught it in time. All the cards have been stopped. We've paid damages and none of our customers have indicated legal action. I think we are fine.

[pause as John considers the situation]

Derrick: Listen, John, we are very concerned that we maintain strong internal controls. *I readily concede that we had a couple of control issues.* But, (*we do not have issues with our controls. There is nothing wrong with our controls over system security. These issues that you've brought up are things that are beyond the control of any normal business or system. And,*) with our compensating controls, nothing has occurred that caused a material misstatement of profits.

Manual Control Deviations

Specific Issues determined in testing application controls in the revenue cycle:

1. Near the end of the year, the electronic approval by the credit manager was missing for several customer orders that exceeded the credit limit. These orders were still processed without the approval.
2. The analysis of the daily unapplied cash exception reports indicated a number of unreported discounts to customers. Upon further investigation the auditor found that salespeople gave discounts to customers and failed to record them on the customer order. In most instances, adjustments to revenue were made without contacting the salespeople.

Manual Control Deviations Conversational Vignette

The audit senior on the engagement, John, follows up on these issues with Derrick, the controller of Griffin Inc. The following is the discussion between John and Derrick.[19]

> **John:** Hi Derrick. I scheduled this meeting with you to discuss some findings related to our controls audit. First, I'd like to discuss the controls over the approval of credit.
> **Derrick:** Sit down, John. I'd be happy to discuss that with you. We have a credit manager who approves all customer credit limits and then approves all orders exceeding the credit limit specifically determined for each customer. When we have a new customer, our credit manager uses a software application that allows him to check credit ratings with three credit rating agencies. Once he has the credit ratings, he assigns a credit limit. He also reviews credit ratings for all customers on a semi-annual basis and adjusts the limits accordingly. For our largest clients, he performs this on a quarterly basis. When orders come in, they are checked against the current available credit limit. If there is not enough available credit, the order is reviewed. If approved, the credit manager uses a special password to approve the order and release it for processing. What else can I tell you?
> **John:** Well, I am familiar with the process that you just described; however, when we were performing our tests over revenue cycle application controls, we found some orders that were missing an approval from the credit manager. It appears that these orders were routed through the system in another way and were filled without credit approval.
> **Derrick:** *John, I admit that we did have a small breach of controls in credit approval.* (*John, this was not a control breach. This was an unusual incident due to circumstances beyond our control.*) During September, our credit manager was really sick and had to be out for several weeks. So, we performed a handful of system overrides to release orders for processing. (*We have no power over situations like this. The guy was so sick we couldn't even discuss the situation with him for over a week.*)
> **John:** Oh. Who performed the override and did this individual check the available credit?
> **Derrick:** The system override was performed by the Service Specialist Supervisor, Brenda. She was able to check available credit for our existing customers, but she could not access the software to check credit for new customers. *We would have liked to take the time to get the access, but we needed to process the orders in a timely manner. It affected only a few new customers and we monitored it closely. John, I concede that we had a breach of this control, but as I said, we monitored it closely.* (*This was an isolated case based on events that were outside our control. It affected only a few new customers and we did not want to risk losing those customers simply because we couldn't check their credit in a timely fashion. We had no other alternatives and we monitored it closely. John, this is not a breach of controls.*)
> **John:** I guess the next question that I have is whether you know if this has had any impact on your financial statements.
> **Derrick:** Frankly, we did have one new customer that placed a very large order that was approved without a credit check. If those amounts hadn't been paid, that could have affected our results for this year. But, the important point is that the account was paid.

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[19] Italicized text represents the concession manipulation. Italicized text in parenthesis represents the denial manipulation.

John: OK, let's get to the next issue. It appears that customer discounts are not always recorded. Additionally, we found evidence that some unrecorded discounts are excessive.

Derrick: *Again, John, I have to admit that sometimes this control has been breached.* (*Again, John, this was not a control breach. This issue is due to circumstances beyond our control.*) Our salespeople are required to record all discounts and our system checks to ensure that discounts are within acceptable limits on all orders. But, the salespeople do not always do it. (*Sometimes, they get busy, forget, and do not record the discount or get approval, but that's just human error outside our control. We remind them, but John, you know what salespeople are like. They're not like auditors. They just aren't as good about paperwork.*) *However* (*And*), do not forget, John, I review a gross margin report on a monthly basis to make sure that something like excessive discounts does not get out of hand.

John: Is anyone doing anything else to ensure the accuracy of invoice amounts around quarter ends?

Derrick: No, because I am reviewing gross margin reports that would pick up any material misstatements. I fully recognize that our product line has wide variation in margins, but I think that I have enough experience to know if something is seriously out of whack.

[pause as John considers the situation]

Derrick: Listen, John, we are very concerned that we maintain strong internal controls. *I readily concede that we had a couple of control issues. But,* (*we do not have issues with our controls. There is nothing wrong with our controls over revenue. These issues that you've brought up are things that are beyond the control of any normal business or system. And,*) with our compensating controls, nothing has occurred that caused a material misstatement of profits.

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BOOK REVIEWS

Stephen A. Zeff, Editor

Editor's note: Two copies of books for review should be sent to the Book Review Editor: Stephen A. Zeff, Rice University, Jesse H. Jones Graduate School of Business, 6100 Main St., Houston, TX 77005. The policy of *The Accounting Review* is to publish only those reviews solicited by the Book Review Editor. Unsolicited reviews will not be accepted.

GREGORY B. WAYMIRE and SUDIPTA BASU, *Accounting is an Evolved Economic Institution* (Hanover, MA: now Publishers Inc., 2008, ISBN: 978-1-60198-160-8, pp. ix, 175).

To the marginalized American accounting historian, this thin but meaty volume will be viewed as a ray of hope. Despite the best efforts of the American Accounting Association, the AICPA, and the Accounting Education Change Commission, the importance of accounting history remains largely unappreciated by accounting academicians and practitioners to a degree not reflected in other parts of the globe. The emphasis of American scholars on capital-markets research has resulted in the virtual elimination of history articles from flagship academic journals, the refusal of most doctorate-granting universities to countenance accounting history dissertations, and the severe discounting of history articles in personnel actions at most prestigious universities. Now two distinguished capital-markets scholars have put the case strongly that their chosen brand of research is improved when informed by the historical background of the institutions or regulations they are investigating.

The short first chapter is dedicated to the authors' positive assessment of accounting history's value. Waymire and Basu (W&B) offer five compelling reasons in defense of their perception (pp. 2–4):

- History assists researchers to understand the context in which accounting institutions developed and evolved into their present forms.
- History provides the opportunity to study issues of significance over an extended time horizon.
- History allows for a focus on evolutionary accounting theories that scholars need to grasp in order to understand the deeper functioning of accounting.
- History generates the knowledge that aids researchers in avoiding "confirmation bias."
- History helps in the development of a professional accounting identity for scholars and students.

In Chapter 2, W&B introduce "six 'big picture' questions" that serve as an organizational framework for the remainder of the book. Because of their importance, I will refrain from paraphrasing and allow the authors to speak for themselves (pp. 7–8):

(1) "Why is the recordkeeping core of accounting important?
(2) "How could basic functions like double-entry bookkeeping enable large-scale capitalism?
(3) "How can accounting 'standards' form spontaneously in the absence of bodies explicitly charged with standard setting?
(4) "In what ways, both beneficial and detrimental, has accounting practice been influenced by law, regulation, and taxation?
(5) "Why are broad principles important to accounting but not other fields like marketing?
(6) "Why is accounting evolution subject to major discontinuities that arise from changes made in response to economic crises?"

Chapter 3 begins with a lengthy list of events in accounting history related to the six questions presented above, in chronological order (pp. 10–15). The list cannot be inclusive and does contain some quantum leaps, such as the absence of any entry reflective of bookkeeping's importance between a 1673 French ordinance and President

Bush's signing of the Sarbanes-Oxley Act in 2002. Following thereafter is a short discussion of the six questions individually in consort with their related events. Here the admixture of American and foreign events spawns some confusion. For example, W&B claim that depreciation became "significant" only with the advent of large American corporations (p. 18). This was possibly true in the U.S., but certainly not in the U.K., where research into large, capital-intensive firms of the British Industrial Revolution has shown an awareness of systematic depreciation a century earlier. In these discussions, the reader is introduced to a number of important themes that are discussed in greater depth later in the book, including the evolutionary link between accounting and economic complexity and the "enormous" influence of regulation on accounting (pp. 19, 22). A fuller elaboration is provided on the discontinuous nature of accounting history wherein change is linked to economic crises and their aftermaths. The authors conclude, "Our lack of understanding of the relation between crises and accounting change is a major gap in our collective knowledge of how accounting has evolved to take its modern form" (p. 25). The point would have been more strongly made, however, had examples been given as to when accounting historians have failed to analyze sufficiently the interface between economic crises and accounting change.

The next chapter is a forceful statement of support for historical case studies. While a growing number of distinguished business schools have embraced the case-study method, the efforts of those researchers who have collected and analyzed the necessary materials go relatively unrewarded. Journals that specialize in case studies do not rank highly on lists of preferred publication outlets. The shortfall of case studies is especially severe in accounting history.

W&B present an interesting case from their own research in which they link General Electric Company's conservative valuation of intangibles dating from the first decade of the twentieth century to the mindset that induced the FASB to mandate the expensing of research and development costs (pp. 29–37). From this vignette, W&B identify three lessons for accounting research:

- Standardization of accounting practices may precipitate a "material loss of information to financial statement users" (p. 37).
- Accounting methodologies are often common practice before the formal imposition of regulation by standard-setters (p. 38).
- Accounting practice is path dependent, influenced by "important forces that fall beyond our immediate view" (p. 39).

Although strong defenders of case study, W&B objectively concede that there are drawbacks to that format for the publication of research results. Historical cases can precipitate "counterfactual thinking" when yesteryears' accounting truths no longer hold (p. 28). Another danger lies in assuming that the results from the study of a single company or event have a broader applicability (p. 40).

Historical case studies can do valuable service by either exploding widely held myths or at least bringing what passes for common knowledge into question. For example, post-SEC regulation has been deemed "beneficial" by several scholars, a view seconded by the market-leading Intermediate Accounting textbook. Meanwhile, pre-SEC studies have revealed that the reporting was not as poor as assumed and that SEC/FASB regulation has had "detrimental effects" on occasion (pp. 43–49).

The first four chapters of the book would be welcome collateral reading for an undergraduate course for accounting majors. Students preparing for careers in the accounting profession are introduced to the value of history, information that is rarely conveyed in the American educational system using textbooks authored by American academicians. The strong support for case studies holds the promise of generating in young minds a modicum of critical thought about their chosen profession. The longer and more intense Chapters 5 and 6, by contrast, are more geared toward graduate-level students and academicians.

Chapter 5 contains some very detailed studies designed to show how historical data can be deployed to test hypotheses. Three vignettes are culled from the economics literature. The most imaginative of these compares the success rates of private versus public financing of Arctic exploration (pp. 56–57). Although one can only applaud the interdisciplinary perspectives gained from nonaccounting literature, one might wonder how accounting scholars have the time to locate and access these studies. A number of accounting history studies are also presented to disprove myths arising from issues related to the six questions (e.g., that state blue-sky laws were legislated in response to frauds [pp. 77–78], that Interstate Commerce Commission depreciation rules achieved a smoothing of railroad company income [p. 79], that regulation can promote efficiency and competition but only at the expense of redistributing wealth [p. 80], that SEC disclosure requirements render accounting numbers more informative [p. 84]).

The chapter is highly oriented toward published work by the authors and their coauthors. While a broader brush might have been desirable, perhaps the limited number of capital-markets researchers concerned with historical backgrounds may excuse the narrow focus. The research reported is highly cliometric, which raises issues that still impact the economics literature (econometrics) and threatens to do so in accounting as well. It will be recalled how Fogel and Engerman (1974) were pilloried because they found that slavery was an efficient labor system, that the plantation system was profitable, and that slaves in the antebellum U.S. South had a higher living standard than northern factory workers without demonstrating what many thought a proper concern for the psychological, sociological, and cultural horrors of the "peculiar institution." In this chapter as well, the case is strongly made that capital-markets research, beloved by U.S. academe, can be enhanced by historical data.

Chapter 6 is entitled "Future Research: Toward an Evolutionary Theory of Accounting." As a trained historian, I am wary that "evolutionary" may connote the "Whig theory of history," now very much is disrepute. However, W&B do distance themselves from that interpretation because they do subscribe to both positive and negative discontinuities in history and because they link accounting's evolution to economic complexity, which is frequently not beneficial. However, they might have been well served to distance themselves from historian D. C. North (1990), whose quote on the subject smacked of whiggery (p. 96).

Historically, new accounting methodologies are introduced in response to new forms of business transactions and organizational structures. In the late eighteenth and early nineteenth centuries, best practice was initiated through a sharing of knowledge, although accounting historians of decades ago thought secrecy prevailed. In more modern times, however, regulation and economic crises became primary determinants of changes in accounting methodologies (p. 99). It is my feeling that the authors should have provided the reader with more historical evidence of these dynamics. However, they do present thoughts on future research directions within the evolutionary context they advocate. True to their roots, W&B advise: "If the evolutionary hypothesis is valid, this suggests that accounting choices that have direct cash flow effects due to regulation and taxation will be better 'explained' by empirical models of accounting choice" (p. 122). Similarly, the relation between transaction structures and accounting standards should be studied. The links between accounting regulation and economic crises should be researched with specific attention given to the role of accounting information in times of crisis and as well with the issue of the impact of additional accounting regulation typically legislated in response to these crises (pp. 132–134).

The book's bibliography is extensive, comprising 20 percent of the total pages, making it a vital resource. The entries are broadly interdisciplinary, although economics is accorded a heavy emphasis. There is a particular dependence upon the authors' own work, the positivists Watts and Zimmerman, the economist Hayek, and Littleton, a father of accounting history. Notably absent are references to the Chatfield/Vangermeersch encyclopedia (1996) and Garner's classic history of cost accounting (1976).

It is my fond hope that the book will achieve a purpose of substantial significance—convincing capital-market researchers and others whose work is highly empirical that history is capable of informing their scholarship. Otherwise, the book's impact will only be preaching to the choir. W&B concede that their book makes a narrow survey of the accounting history discipline. The book is both Anglo-centric and focused on economic theory. There is little discussion of critical accounting historians, who seek to reform practice, often with recourse to history. Closely related are the moral lessons to be drawn from accounting's past, particularly those instances when practitioners failed to rise to the highest ethical standard. Here again, W&B do not address this vital benefit potentially gained from an investigation of the historical background of contemporary institutions. The omission of cost accounting topics is also evident and is especially difficult to fathom in the light of W&B's complaint that financial reporting textbooks emphasize valuation and stewardship roles to the exclusion of managerial decision making (p. 110).

By way of conclusion, the authors in a thin volume such as this could never aspire to do justice to the extensive parameters of accounting history. Within the limited framework of what they hope to achieve, namely, to convey the message to empirical accounting researchers that their scholarship would be rendered more robust with recourse to the historical background of the issues under investigation, the book succeeds marvelously well.

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JOANNE HORTON, RICHARD MACVE, and GEORGE SERAFEIM, *An Experiment in "Fair Value" Accounting? The state of the art in research and thought leadership on accounting for life assurance in the UK and continental Europe* (London, U.K.: Centre for Business Performance, ICAEW, ISBN: 978-1-84152-516-7, pp. 118).

Fair value accounting is currently under public scrutiny because of its assumed role in accelerating and deepening the credit crisis. Publications that shed light on the costs and benefits of applying fair value accounting can therefore be helpful in current debates. In 2007, the Centre for Business Performance of the Institute of Chartered Accountants in England and Wales (ICAEW) published a monograph under the slightly mysterious title. "An Experiment in 'Fair Value' Accounting?" with a question mark. The experiment that the title refers to are the proposals of the IASB on how to standardize accounting for life insurance (although the title of the monograph features the term "life assurance," the more common term "life insurance" is used throughout the text). While restricting the fair value discussion to the life insurance industry seems somewhat limited in view of the current debates, the monograph is written at a conceptual level that ensures that many of the statements it presents are applicable outside the life insurance industry as well. At the same time, it will be difficult to understand the specifics of the arguments advanced in this study without any knowledge of the industry.

The book was published in 2007, well before the credit crisis blew up with the demise of Lehman Brothers in September 2008. The central part of the book contains a discussion of the IASB's Discussion Paper (DP) "Preliminary Views on Insurance Contracts," published in May 2007. This Discussion Paper is the first part of Phase II of the Insurance Contracts project, Phase I having resulted in the publication of IFRS 4. In October 2008, the FASB decided to participate in this project, making it a joint venture of the IASB and the FASB. The current roadmap envisions publication of an exposure draft in late 2009 and a final standard in 2011. From this perspective, an analysis of the strengths and weaknesses of the 2007 Discussion Paper continues to be topical and could in fact assist readers in giving their own comments on the exposure draft due to be published. The book refers to the personal website of Richard Macve for up-to-date copies of evolving new papers, but, until June 2009, no more recent papers on insurance accounting had been placed on the website. Another development too recent to be covered was the publication of the IASB exposure draft on fair value measurement in May 2009. However, as this exposure draft closely approximates SFAS No. 157 and the book contains useful references to that standard, the recent exposure draft does not make the book less useful.

The monograph is divided into five chapters and four appendices and includes a glossary. The first chapter comprises a fairly extensive executive summary. The second chapter provides an introduction to the IASB's 2007 DP, and is relatively short (about half the length of the executive summary). The authors clearly assume that all readers will already have read the discussion paper, but I believe it would have been worthwhile to offer a more extensive summary of the DP.

Chapter 3 sets forth some background to the issues and discusses a number of general aspects. The various sections of this chapter do not interlock closely enough, suggesting that each may have been written by a different author with little effort at overall integration. Furthermore, although the subtitle of the book refers to the perspective of the U.K. and continental Europe, the text is almost entirely U.K.-based. Where reference is made to other countries, in section 3.8, those countries are outside Europe. The only reference to Europe is the EU Insurance Accounts Directive. Of course, Europe applies IFRS, and from that perspective all discussions on IFRS could be considered to be relevant to "continental Europe," but in my opinion it would have been more appropriate to refer to IFRS instead of continental Europe in the subtitle.

Chapter 4, "Analysis of Issues," contains the authors' comments on the questions that the IASB posed in its DP. Their answers to these questions highlight the authors' criticisms of the preliminary views taken by the IASB. Their main comment relates to the proposal to measure insurance liabilities at current exit value. The current exit value is the amount the insurer would expect to pay at the reporting date to transfer its remaining contractual rights and obligations immediately to another entity. The authors state that there is no clear theoretical discussion in the DP of the nature of the market in which the market participants are assumed to operate in determining their measures of current exit value (p. 53). They also have difficulty with using an exit market value when insurers cannot transfer the liabilities to a third party and would not wish to do so (p. 36). The authors conclude that, without an adequate theoretical foundation, the current exit value (and fair value in general) "seem likely to remain largely 'synthetic' accounting artefacts whose usefulness, and superiority over traditional accounting measures, remains unclear ..." (p. 53). They wonder, in particular, whether the concept of embedded value that is currently applied in supplementary statements would not better serve the needs of users of life insurance accounts. Embedded value includes the present value of in-force business and is favored by the leaders of European industry, by many actuaries, and by analysts as providing the most "useful information for economic decisions" (p. 36). However, the exact differences between embedded value (especially the "market consistent" variant of it) and current exit value seem to be a little vague, and even the authors are not very clear on this. I would have preferred some numerical examples to illustrate the differences between the concepts discussed. That might have strengthened some of the views taken by the authors.

Chapter 5 contains the conclusions. About half of the monograph consists of the appendices. Appendix I provides an overview of four accounting-based academic research studies and four working papers. Six of these eight publications are by the authors themselves, and the remaining two are by Klumpes (with whose conclusions the authors do not agree). Appendix II discusses nine articles from the (U.K.) actuarial profession, with comments by the authors. In addition, the views of the industry are presented: Appendix III summarizes the papers of the CFO Forums of 2004 and 2006 and the paper of the Geneva Association 2004. Finally, a summary of some relevant standards, including IFRS 4 and ED34 issued by the U.K.'s Accounting Standards Board, is given in Appendix IV.

For academics, actuaries, standard setters, and life insurance industry professionals, the monograph is a useful exercise in conceptual thinking on life insurance accounting. The authors are very critical of the preliminary views of the IASB and they are not convinced that fair value and current exit value are the right way forward. The IASB and the FASB, as this is currently a joint project, should take the comments of the authors seriously. Two of the authors, Joanne Horton and Richard Macve, work at the London School of Economics (LSE) and have extensive experience in this field. The third author, George Serafeim, an LSE graduate, is a doctoral student at Harvard Business School. What is most important is that the authors' reasoning is based on a conceptual perspective, aimed at providing the most useful information in financial reporting, without the need to defend current industry interests.

For those who do not have a specific interest in the life insurance industry, the book nevertheless contains some stepping-stones for discussions at a more general conceptual level, although it would be quite a difficult challenge to read through the book without an adequate understanding of the life insurance industry. Some of the more general observations are:

- A current exit value for insurance liabilities is a specific interpretation of fair value, which comes close to, or might even be equivalent to, the definition of fair value given in the IASB's May 2009 exposure draft (and in SFAS No. 157). The authors' comments on the current exit value would therefore be equally relevant to the measurement of non-insurance liabilities.
- In the fair value hierarchy, the measurement of insurance liabilities, for which there is no active market, will be based on "level 3 inputs": inputs that are not based on observable market data. This issue is relevant for many liabilities outside the insurance industry. The authors conclude on this point that level 3 inputs "may raise further severe concerns about measuring income and performance on the basis of changes in such values from year to year ..." (p. 37).
- At an even higher conceptual level, the authors doubt whether the "asset/liability model" underlying the current IASB and FASB conceptual frameworks is adequate: "performance measures based on more traditional accounting approaches to 'matching' costs and revenues are likely to provide greater insight into the value drivers of business than simply tracking changes in market prices of assets (and liabilities) held" (p. 40).

Current and future discussions, at standard-setting level, and even at a global political level, may shape accounting for many years to come. The views of the authors of this ICAEW monograph can be helpful in developing the best standards for the measurement of assets, liabilities, and income.

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ROB GRAY and JAMES GUTHRIE (editors), *Social Accounting, Mega Accounting and Beyond: A Festschrift in Honour of M. R. Mathews* (St. Andrews, U.K.: CSEAR Publishing, 2007, ISBN 978:0-9555076-0-1, pp. 336).

Social Accounting, Mega Accounting and Beyond celebrates the work and career of a British-born, Australasian-based scholar by the name of Professor M. R. (Reg) Mathews. For readers who are unfamiliar with Reg Mathews' work, it is probably fair to say that he was something of a pioneer. Beginning in the early 1980s, Reg's publications, conference presentations, and other activities contributed to the development of the Social and Environmental Accounting Movement.

Reg's decision to commit himself to the cause of Social and Environmental Accounting placed him at the margins. Reg published his first Social and Environmental Accounting article in 1981. This was the era of Ronald Reagan and Margaret Thatcher. The profit motive was in vogue, free markets were *de rigueur*, and governments had embarked upon a policy of deregulation. While Margaret Thatcher was proclaiming, "there is no such thing as society," Reg Mathews committed himself to an idea. He believed that social and environmental considerations should rank alongside economic concerns in contemporary organizations. He was also convinced that accounting could promote this kind of change, by reporting on the economic and the social and environmental consequences of organizational activity.

The marginality of Reg's position is illustrated by one of the contributions to this book. Irene Gordon, from Simon Fraser University in Burnaby, British Columbia, explains that 43 articles related to social and environmental accounting have appeared in the pages of *The Accounting Review* since 1971. However, only six of those articles were published after 1980, and five of those six were book reviews! A similar pattern can be found in the pages of *Contemporary Accounting Research.* Post-1992, only one social and environmental accounting article, again a book review, has seen the light of day in that journal.

He may have worked outside accounting's mainstream, but Reg Mathews was no lone voice in the wilderness. As this book illustrates, Reg's career did not lack achievement and influence. Utilizing the pages of journals such as *Accounting, Auditing and Accountability Journal*; *Accounting Forum*; *The British Accounting Review*; and *Accounting Education*, he engaged with, and contributed to, an expanding community of increasingly self-confident scholars who shared his interests and concerns.

This book is devoted to these interests and concerns. The first half consists of ten articles written by members of this community of like-minded scholars. Contributors include the University of South Australia's Lee Parker, Nottingham University's Dave Owen, Macquarie University's Hector Perera, and the University of Canterbury's Markus Milne. Each contributor addresses issues which Reg had developed, supported, and been exercised by during his career.

RMIT University's Craig Deegan makes the first contribution. His analysis of the social and environmental accounting research literature concludes that Australasian scholars have "punched above their weight." He also laments that a disproportionate amount of social and environmental accounting research is the product of several key researchers. These findings he attributes to the leadership role played in Australia and New Zealand by the likes of Reg Mathews, Lee Parker, and James Guthrie. Deegan also suggests that Rob Gray and Dave Own have made a similar contribution, this time providing leadership to British academics.

Glen Lehman (University of South Australia) places Reg Mathews' work in a broader context. Drawing upon "communitarian ideology" and "communitarian ethics," Lehman suggests that social and environmental accounting transcends accounting's traditional instrumental and procedural vision of the world. Social and environmental accounting research elevates accounting's status to a higher level. Accounting becomes an important mechanism in all liberal-democratic societies, one that informs communities about wasteful and damaging resource consumption and the social and ecological burden borne by all members of that community.

Dave Owen addresses the issue of engagement. His interest lies in social and environmental accounting research's impact upon actual accounting practice in businesses and organizations. In this paper, Owen questions the extent to which traditional research approaches such as the case study and interview-based methodologies, stimulate change. In Owen's view, a more effective form of engagement lies in research that collaborates with organizations to develop new accounting systems. One such system is the sustainability assessment model for oil project appraisal designed in collaboration with British Petroleum by Jan Bebbington. Owen also sees value in research that engages with non-managerial interests such as non-government organizations, trade unions, and the like.

Lee Parker explores the role played by the editorial boards of academic journals in the publication of social and environmental accounting research. In conjunction with James Guthrie, Parker is editor of *Accounting, Auditing and Accountability Journal*, a key journal for the social and environmental accounting movement. Parker suggests that editorial board members play two roles. First, they mediate between the journal editor and the community of scholars served by the journal. Second, editorial boards are the constructors and custodians of the journal's stock of knowledge. Consequently, editorial board membership offers the opportunity to participate in, and shape the development of, the community of scholars served by that journal. Editorial board membership is more than simply an exercise in career advancement; it is an expression of the individual board member's commitment to scholarship.

The latter half of the book contains some of Reg's most significant published works. The editor's intention was to select nine papers that reflect on, and provide insights into, Reg's work over the last 30 years.

Reg's 1984 paper, "A Suggested Classification for Social Accounting Research," is described by the editors as a "must read" for those who are new to social and environmental accounting research. In this paper, he introduced these terms: Social responsibility accounting, Total impact accounting, Socio-economic accounting, and

Social indicators accounting. It also displayed Reg's capacity for normative reasoning, as he considered how policy does, and might, develop.

Reg's "The Cultural Relativity of Accounting and International Patterns of Social Accounting," published with Hector Perera in 1990, used Hofstede's classification of national cultures to explore differences in accounting practice in Anglo-American and Continental European cultural environments. In this paper, one finds evidence that accounting practice is shaped by its broader socio-cultural context. The natural implication of this finding is that, as that socio-cultural context evolves, accounting practice must change and adapt.

In 1997, he published "Towards a Mega-Theory of Accounting," which was, without doubt, Reg's most ambitious work. Recognizing contemporary accounting's roots in the 19th century neo-classical economic period, Reg argued that traditional financial accounting reflects the concerns, values, and priorities of that age. However, by the late 20th century, broader concerns about social and environmental outcomes had rendered contemporary accounting out of date. To bring accounting up to date, Reg attempted to develop what the editors call a "conceptual framework" for accounting. This framework embraces social and environmental outcomes ignored by traditional financial accounting practice. As Reg often liked to point out, he may not have coined the term, "triple bottom line," but his vision for "Mega Accounting" was essentially the same.

In 1997, he also published "Twenty-Five Years of Social and Environmental Accounting Research: Is There a Silver Jubilee to Celebrate?" Like his 1984 paper, this literature review is a vital starting point for those wishing to familiarize themselves with the social and environmental accounting research literature.

This book is an ideal introduction not only to Reg Mathews' work, but also to the Social and Environmental Accounting Movement itself, and it will be a valuable reference tool for those who wish to work within that movement.

For those who distrust normative reasoning, the book will make strange and frustrating reading. It contains very little statistical analysis and no econometric modeling. Nevertheless, the breadth and depth of the qualitative analysis compensates for the relative absence of quantitative rigor. In this book, the reader encounters a form of scholarship that is candid about its intentions. This is Critical Accounting Research, research produced by scholars who do want to effect change. The persuasive force of thoughtful analysis, reasoned argument, and convincing narrative is this community's *modus operandi.*

There is no doubt that Reg Mathews' interest and concerns became increasingly mainstream as he approached retirement. As newspaper headlines began to warn of global warming, environmental issues gained greater prominence. The environment now resonates with electorates and the politicians they elect. Global Economic Crisis has re-awakened regulatory instincts that had hitherto lain dormant since the election of Ronald Reagan and Margaret Thatcher.

At times, this book is guilty of undue triumphalism. Reg spent his career among a community of scholars who became increasingly convinced that the world was changing and that social and environmental accounting was the way of the future. Yet, as Irene Gordon's and Dave Owen's contributions point out, this is a community that feels frustrated by its lack of impact. Social and environmental accounting has yet to enter the discipline's mainstream and has failed to engage with real-world organizations and institutions.

Reg's career and this book serves to remind accounting practitioners and academics that contemporary accounting research is a "Broad Church." Thanks to a proliferating number of journals and conferences, the contemporary accounting academic can engage in research that reflects all aspects of the political, economic, and cultural landscape in which accounting is practiced. The 1980s and 1990s may have been a period of deregulation and neo-liberalism; nevertheless, during that same period Reg Mathews was able to find a community of like-minded scholars who shared his concerns for the social and environmental impact of contemporary capitalism.

Today, the realm of accounting research accommodates empiricists, neo-classicists, neo-liberals, conservatives, Marxists, radicals, feminists, and post-modernists, among others.

As academic and professional accountants, we have a choice. We can believe that accounting practice and research cannot be divorced from the neo-classical and neo-liberal ideologies that have shaped its development to date. Alternatively, we can open our minds to the possibility that accounting possesses the capacity to change and is also a vehicle to promote change. If we adopt the former view, we will withdraw from many of the debates that are now shaping the future and allow the world to change of its own accord, in ignorance of the true potential of accounting. If we adopt the latter view, we equip our discipline with the capacity to engage in those debates. Fundamentally, Reg Mathews and the other contributors to this book would argue that, if we cannot embrace the possibility of diversity and change in accounting practice and research, then accounting and the world it serves would be the poorer for it.

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Annual Report and Editorial Commentary for *The Accounting Review*

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Prepared June 2009

I. INTRODUCTION

The Publications Committee and Executive Committee of the American Accounting Association (AAA) have adopted a new format and content for the annual reports submitted by AAA journal editors. My understanding of the spirit of the changes is to provide AAA constituents with more accountability of journal activities and decisions. I applaud this intent, and am pleased to submit this first Annual Report for *The Accounting Review* under the new guidelines. Given that this is the first year of the new format, I am also taking the liberty of interjecting some editorial commentary to assist the reader in interpreting the new data. That said, some of my interpretations reflect opinions, and the reader is certainly free to consider alternative interpretations.

The new report is broadly classified into two major sections. Section II provides qualitative commentary on the editorial process followed by *The Accounting Review* under the current regime. Section III then follows with the tabular data requested by the AAA Publications Committee, along with some supplemental data I have provided to clarify certain aspects of these tables.

II. *THE ACCOUNTING REVIEW* EDITORIAL PROCESS

Transition

My term as Senior Editor of *The Accounting Review* (*TAR*) began on June 1, 2008, so this report covers the first fiscal year of operations under the new editorial regime, through May 31, 2009. Former Senior Editor Dan Dhaliwal and I agreed on some simple guidelines to ease the transition. Specifically, the former regime maintained full decision rights over all manuscripts for which all material necessary for a decision was available to the former regime on May 31, 2008, even if the former regime had not yet processed its decision letter by that date. Thus, the current regime handled (1) in-process submissions awaiting one or more reviews as of June 1, 2008, and (2) all manuscripts (new or revised) submitted on or after June 1, 2008. For revised manuscripts in both categories, I considered factors on a case-by-case basis to determine whether to remand the decision back to the former regime or to transition it to the new regime, though most were transitioned. As the reader will see from the several *TAR* articles published in 2009 with a note indicating a decision under the new regime but thanking a former editor for serving as editor on one or more

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I thank Linda Bamber for offering some constructive wording suggestions on a prior draft, though I take full responsibility for the final report.

previous versions, there are simply too many revision files to justify remanding many of these to the former regime. At some point the term should end, giving former editors some relief from the time-intensive work they have just completed.

Process for New Submissions

Suitability for Review

When my Editorial Assistant, Mary Capps, receives a new *TAR* submission, her first step in the process, after assigning a sequential manuscript number and logging the submission in our system, is to search our computer database for related previous submissions by the same author(s). I have been surprised by the number of times that this process has uncovered a former closely related *TAR* submission, often with no disclosure in the correspondence accompanying the current submission. Mary prints and provides me with copies of both manuscripts in such circumstances. If I conclude that the submission is effectively a revision of a manuscript previously rejected by *TAR* with no invitation to revise and resubmit, I generally log the decision as a desk rejection and send an explanatory letter to the author(s). My co-editors and I adopted this policy to treat all authors fairly and consistently, given that *TAR*'s large submissions volume forces us to allocate scarce reviewer and time resources carefully by offering a revision opportunity only to the most promising manuscripts. Put simply, the distinction between a "reject" and a "revise and resubmit" outcome has to mean something, or we lose control over the process and could easily get overwhelmed by "appeals."

To be sure, sometimes a new submission that overlaps somewhat with a previously rejected manuscript by the same author(s) *is* effectively a new study, especially if it asks a different research question and/or utilizes different data. These cases can boil down to judgment calls, so I will offer some well-intended advice to prospective authors. When submitting a manuscript that bears some relation to a manuscript by the same author(s) that was previously rejected by *TAR*, if the current submission is effectively a new study, then explain why it is a new study in the cover correspondence to the editor. The editor will still desk reject the manuscript if the editor feels that the submission is more a revision of the rejected former submission than a new study, but the odds of convincing the editor go up substantially with full disclosure.

Assuming that a new submission clears the "new study" screen, I take a quick look at the manuscript to ensure that it is suitable for review, or, in exceptional circumstances, ask one of my co-editors to make that assessment. It is rare that we desk reject a manuscript for reasons other than the "double submission" problem explained above, but this can happen if the submitted manuscript (1) does not appear relevant to accounting, even broadly defined, (2) is so difficult to follow that the editor cannot grasp the research question or primary conclusions, or (3) does not appear to use the tools of the scientific method (broadly construed to include all forms of empirical, archival, experimental, field, survey, and modeling analyses) to investigate a relation between constructs. The third category includes commentaries that espouse an opinion without evidential or analytic support, not because such efforts are unimportant, but because *TAR*'s primary mission as stated in its Editorial Policy is for "publishing articles reporting the results of accounting research." Other publication venues are more well suited to unsolicited commentaries. These points notwithstanding, it is important to put the desk-reject option in perspective. For the journal year ending May 31, 2009, desk rejections for the reasons explained in this paragraph accounted for only about two percent of all new submissions, and the majority of those were due to lack of perceived relevance to accounting, even broadly defined. Thus, the vast majority of *TAR* submissions enter the review process.

Identifying Reviewers

Assuming that a new submission is suitable for review, the next step in the process is to identify prospective reviewers. We have several searchable resources for this purpose, including (1) a database of *TAR* article titles and keywords dating back to 1997, (2) a combined (huge) pdf file of the academic *vitae* of all members of the *TAR* Editorial Advisory and Review Board, (3) a list of expertise keywords submitted by the Editorial Advisory and Review Board members upon invitation to the Board, (4) citation analyses, and (5) the manuscript itself, including its cited references. I usually ask my doctoral research assistant, Tracie Majors, to conduct searches of this nature, using the submitted manuscript's keywords and introductory pages to gain a sense of the research question, primary findings, and any potential conflicts of interest with competing papers or competing views. To be clear, Tracie only offers suggestions (typically a long list). I make the decisions, after clearing prospective reviewer names against another database of current review assignments. Generally, once a reviewer receives a review request from *TAR*, that person is off limits for further requests for two months, with the exception of requests involving invited revisions, as we have no choice for revisions if we wish to retain reviewer continuity.

TAR avoids assigning reviewers who have known conflicts of interest from affiliations with the author(s) by institution, doctoral supervision, or recent coauthorship. *TAR* also uses a double-blind review process. That said, prospective reviewers sometimes inform us of prior knowledge of a manuscript from having seen it presented or (sometimes) by having reviewed it previously for a different journal. Our policy is that such instances do not automatically disqualify a reviewer, as long as that reviewer is comfortable undertaking an independent review of the manuscript as currently submitted. However, if the reviewer is uncomfortable, then we are certainly willing to recuse that reviewer from the assignment. Finally, although I try to avoid assigning a reviewer who is known to be associated with the author, I do *not* consider the author(s)' acknowledgements note in making this determination. In fact, I try to ignore that note altogether. My rationale is to remove any strategic implications of acknowledgments. That is, if acknowledgments were to influence the review process, some authors might be tempted to "game" the process by acknowledging a dreaded reviewer or not acknowledging a desired reviewer. As Senior Editor, I certainly would not want to discourage authors (especially newer authors) from seeking feedback from a respected scholar in the area for fear of disqualifying that individual as a reviewer.

Following tradition, *TAR*'s general policy is to designate two independent reviewers for each new submission that is suitable for review. Given this policy, a senior editor learns quickly that reliable reviewers are a very scarce resource relative to the volume of submissions. The 124 members of the *TAR* Editorial Advisory and Review Board are our most demanded reviewers, reflecting their expertise as well as their track record of constructive and timely reviews. A total of 124 Editorial Board members may seem a large number, but it is not, at least not relative to the volume of new submissions.

Each Board member agrees to complete six reviews of new submissions each year in addition to reviewing occasional revisions. Even with a workload that intense, we would very quickly run out of available Board members at any point in time if we sent each submission to two members of the Board. Accordingly, *ad hoc* reviewers (often researchers who have published at least one article in *TAR* since 1997) are vital to the process, and are named (with my deepest gratitude) at the end of this report. A common approach for many new submissions is to designate one reviewer from the Editorial Advisory and Review Board or a close substitute (e.g., a senior *ad hoc* reviewer with a proven track record in the area of the submission) and one more junior reviewer. To answer a question I fielded at the 2008 AAA New Faculty Consortium, assistant professors should never assume that a review request to a less experienced reviewer signals the editor's perception that the manuscript is of relatively low quality. A signal of that nature would be very unfair to submitting authors, so let me be clear that reviewers at all levels of experience receive review requests from *TAR* for only one reason: expertise in the area of the submitted manuscript. Another "non-signal" in the process is the designation of Reviewer A and Reviewer B. I employ an algorithm based on the manuscript number to ensure that the A/B designation is completely arbitrary.

Assigning an Editor

After identifying two qualified and available reviewers for a new submission (a process I feel is important to centralize to ensure a reasonable degree of uniformity over reviewer selection), the next step is to assign an editor. As the reader will see from *TAR*'s inside cover material, I am privileged to serve with 13 outstanding co-editors, each with full decision rights for all manuscripts assigned to that editor.

I try to match manuscripts with the most well-suited editor from both a topical and methodological perspective, but this matching process is subject to an important caveat. Namely, part of the "contract" I arranged with each of my co-editors at the onset of my term was to limit their editorial assignments to three new submissions per month. This arrangement makes me the "residual claimant" once the three-per-month constraint becomes binding for any given co-editor. The constraint is especially binding for my co-editors whose expertise is primarily in financial empirical-archival research, which alone accounts for nearly half of our submissions, as detailed later in this report. To get specific, Professors Kallapur, Thomas, Trombley, Walther, and Zarowin can always count on three "editor requests" each month. For other co-editors, the "three-per-month" constraint is binding in many but not all months, depending on our submissions flow. For the journal year ending May 31, 2009, *TAR* processed 719 editorial decision letters (including letters on revisions, as detailed later in this report), of which 345 (48.0 percent) were written by yours truly, 333 (46.3 percent) were written by one of my 13 co-editors, 34 (4.7 percent) were remanded back to one of the editors from the former regime, and 7 (0.9 percent) were written by a special *ad hoc* editor.

When accepting an editor assignment, the editor (if other than me) also considers the reviewers I propose from the reviewer identification process. The editor either approves the suggested reviewers as proposed or suggests alternate reviewer(s). If the editor's alternate reviewer(s) are available, then the assigned editor's preference takes priority. We do not send out review requests until the assigned editor approves those requests.

Reviews and Decisions

In addition to requesting a review report that we can send to the author(s), our regime has implemented a two-page "Review Form," as reproduced in Appendix A of this report. We prefer that reviewers complete the Review Form in lieu of a cover letter to the editor. The first page of the form places the reviewer's recommendation into one of five categories: (1) conditional accept, (2) revise and resubmit, (3) uncertain, (4) reject due to insufficient contribution, or (5) reject due to validity threat. The two reject categories reflect an attempt to give the editor some guidance as to whether the primary objection leading to a reject recommendation is that the manuscript's claims are insufficient for publication in *TAR* (contribution) or because the reviewer feels that the claims lack validity. The "uncertain" category is for (ideally rare) cases in which it is genuinely unclear whether even a diligent revision could potentially address the concerns raised, but the reviewer is willing to consider such an effort if the author(s) see a viable revision path that is not apparent to the reviewer.

Editorial decision letters follow the same five categories. For new submissions, the vast majority of decisions are logged as a rejection due to insufficient contribution (45.5 percent), a rejection due to validity threat (24.8 percent), or an invitation to revise and resubmit (18.8 percent). "Uncertain" decision letters are less frequent (10.5 percent), and convey explicitly that the editor is guardedly willing to allow a revision, but cannot realistically encourage a revision unless the author(s) see a way to address significant concerns that imply considerable outcome risk. "Uncertain" letters ask author(s) to submit an email reply indicating whether the author(s) intend to exercise the revision option the editor is allowing but does not necessarily encourage. Author(s) should understand that the probability of an eventual acceptance is relatively low when the first-round letter follows the "uncertain" template.

I read each decision letter written by one of my co-editors and sometimes suggest edits, though I try not to micromanage the process. I never overrule a co-editor's decision; assigning a manuscript to a co-editor gives that co-editor full decision rights.

Revisions

Our standard procedure, subject to override in exceptional cases, is to send first revisions back to the same reviewers. The reviewers' second-round evaluations form the primary input for the editor's decision, so a "revision" option by no means guarantees eventual publication, though the odds do improve relative to first-round decisions. If further revision is invited, the editor assesses on a case-by-case basis whether it is necessary to return a second revision to one or both reviewers or if the editor can reach an informed decision on a second revision without further independent review. Third revisions (i.e., fourth round) and beyond are rare. Of the 719 decisions reached during the journal year ending May 31, 2009, only 13 (1.8 percent) were in the fourth round, and none went to a fifth round.

Consistent with *TAR*'s stated Editorial Policy, we expect author(s) to submit a revision within one year after receiving an invitation to revise. Although I have been willing to "grandfather in" revisions of older files from first submissions predating the current regime, the first-round "revise-and-resubmit" letters written after June 1, 2008 have stated the one-year expectation explicitly, and I anticipate enforcing it when necessary.

III. EDITORIAL AND PUBLICATION STATISTICS

This section of the report provides specific tables requested by the AAA Publications Committee, along with some supplemental data for clarification. To differentiate the supplemental material, each table first reports the specific data requested by the Publications Committee, followed by any supplemental data explained in the discussion of each table.

Table 1: Annual Activity Summary

Table 1, Panel A reconciles *TAR*'s workflow for the journal year ending May 31, 2009, accounting for the 719 decisions referenced in Section II of this report. As noted in Panel A, *TAR* received 557 new submissions during the year (excluding four invited commentaries),[1] which sets an all time record by far. My co-editors and I are processing decision letters every day of the week, including weekends. Of course, some days are more saturated than others.

A limitation of Table 1, Panel A, is that logging all submissions results in double counting some manuscript files, to the extent that *TAR* often receives two or more versions

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[1] *TAR* published two research forums during 2009, each with an invited commentary to synthesize the research articles in that forum. In addition, *TAR* published two AAA Presidential Scholar Addresses during 2009, both invited.

TABLE 1
Annual Activity Summary

Panel A: Activity for the Journal Year Ending May 31, 2009

Manuscripts in Process on June 1, 2008 (a)	New Submissions Received after June 1, 2008 (b)	Resubmissions Received after June 1, 2008 (c)	Manuscripts Available for Evaluation (d) = (a) + (b) + (c)	Decision Letters Sent (e)	Manuscripts in Process on May 31, 2009 (f) = (d) − (e)
133	557	163	853	719	134

(a) Manuscripts in process include all new submissions and revisions pending decision (generally awaiting review), but exclude manuscripts awaiting revision from authors.

(b) New manuscripts, excluding resubmissions of revised manuscripts.

(c) Resubmissions of invited revisions.

(d) Summation of columns (a), (b), and (c).

(e) Completed decision letters represent 646 unique manuscript files and 73 subsequent decisions of manuscripts previously evaluated as a "revise and resubmit" decision within the same fiscal year.

(f) Manuscripts awaiting review and/or editorial decision as of May 31, 2009.

Panel B: New Submissions by Calendar Year

Calendar Year	New Submissions
1998	196
1999	239
2000	260
2001	328
2002	324
2003	327
2004	307
2005	389
2006	413
2007	443
2008	482

of the same manuscript within the same year, following invitations to revise and resubmit. Accordingly, the reader should be aware that the 719 decisions reflect 646 unique manuscript files, with the difference of 73 representing revisions of manuscripts for which previous decisions inviting revision had already been logged within the same fiscal year.

Table 1, Panel A is in a different format and covers a different period (the journal's fiscal year instead of the calendar year) than in the "Editorial Data" reports of prior *TAR* volumes. To facilitate comparability, Table 1, Panel B provides the same new submission data as in prior Editorial Data reports, using *calendar* years instead of the fiscal year, through calendar 2008.[2] The excess of the fiscal year new submissions through May 31, 2009 (557) over the new submissions for calendar year 2008 (482) reflects *TAR*'s ever-increasing submissions rate. Indeed, the 482 new submissions received in calendar 2008 reflect a 146 percent increase from the 196 submissions ten years earlier (1998) and a 47 percent increase from the 327 submissions five years earlier (2003). This trend seems to be continuing.

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[2] Data for calendar 2009 are not yet available as of the date of this report.

Table 2: Annual Outcome Summary

Authors are always interested in acceptance rates, so Table 2 provides the outcomes for the 719 decisions reached during the fiscal year. As requested by the Publications Committee, this panel also reports two "acceptance rates." The first rate of 16.6 percent divides the number of acceptances or conditional acceptances (81) by the number of final accept or reject decisions (489). The second rate of 11.3 percent divides the same 81 (conditional) acceptances by the total number of decisions reached (719). The difference in the two denominators reflects 230 invitations to revise and resubmit (of which 166 were in the "revise" category and 64 in the "uncertain" category). Undoubtedly, the first rate somewhat overstates and the second rate somewhat understates the "true" acceptance rate. As an aside, Table 2 includes "conditional" acceptances in the acceptance category, as the conditions are generally minor and straightforward to address, as long as the author(s) are willing to do so. To date, we have yet to reject any manuscript that has reached "conditional acceptance" status.

Table 2 is subject to the same limitation noted earlier in the discussion of Table 1, Panel A: both tables double count manuscript files that receive two or more decisions within the same year due to an invitation to revise and resubmit. To get the breakdown of decisions for unique manuscript files (i.e., counting each manuscript only once), the number of revisions should be reduced by 73, the difference between the total number of decision letters (719) and the total unique manuscript files represented by those decisions (646). In turn, this observation suggests yet another possible "acceptance rate": 81 (conditional) acceptances ÷ 646 unique manuscript files on which decisions were reached = 12.5 percent, bearing in mind that several of the 646 files are still open to revision.

The alert reader will observe that the 81 acceptances reported in Table 2 exceed the 65 refereed research articles actually published in *TAR* during calendar 2009 (which roughly

TABLE 2
Annual Outcome Summary for the Journal Year Ending May 31, 2009

Decision Letters Sent (a)	Rejections (b)	Revise and "Uncertain" Decisions (c)	Acceptances and Conditional Acceptances (d)	Acceptance Rate 1: (e) = (d)/ [(b) + (d)]	Acceptance Rate 2: (f) = (d)/(a)
719	408	230	81	16.6%	11.3%

(a) This column is the same as column (e) of Table 1, Panel A, reflecting all decision letters sent during the fiscal year, including 73 decisions on manuscripts that had already been evaluated previously within the same fiscal year (with invitation to revise and resubmit). Thus, the 719 decisions reflect 646 unique manuscript files.

(b) Rejections include 259 rejections due primarily to insufficient contribution and 149 rejections due primary to a perceived threat to the validity of the reported claims.

(c) The 230 total revision decisions include 73 revisions that were subsequently resubmitted and logged again as a separate decision within the same fiscal year (see note for column (a) above). Of the 230 total revisions, 166 were logged as standard "revise-and-resubmit" decisions and 64 were logged as "uncertain" decisions that allow but do not necessarily encourage resubmission.

(d) Of the 81 decisions logged as acceptances or conditional acceptances, 65 were published in Volume 84 of *The Accounting Review* (i.e., calendar 2009). Both totals exclude four invited commentaries.

corresponds to decisions reached during the fiscal year ending May 31, 2009, as the AAA requires the contents of each issue to be submitted to the AAA five months in advance of the publication date). At the time of the editorial transition on June 1, 2008, *TAR* was operating on an issue-by-issue basis, meaning that the entire inventory of accepted manuscripts at any point in time comprised the articles submitted for the next issue's due date. Since June 1, 2008, *TAR* has accumulated a bit of a "buffer" of accepted or conditionally accepted manuscripts (much to my relief). So, for example, as of June 1, 2009, the next acceptance would be scheduled for publication in March 2010. If and when *TAR*'s inventory buffer forces authors to wait more than a year to see their articles in print, the AAA and *TAR* editors may need to revisit policy questions regarding journal capacity, number of issues per year, and/or target acceptance rates.

Chart 1: Histogram of Editorial Rounds and Outcomes

The Publications Committee has asked for a histogram of decision outcomes by round, as reported in Chart 1. I am taking the liberty of reporting somewhat finer detail than that requested by the Committee, showing separate bars for "revise" and "uncertain" invitations as well as separate bars for "contribution" and "validity" rejections. The 552 first-round decisions in Panel A of Chart 1 differ from the 557 new submissions reported in Panel A of Table 1 because Chart 1 includes 93 new submissions "in process" as of June 1, 2008 and excludes 98 new submissions for which a decision had not yet been reached as of May 31, 2009.

Chart 1, Panel A shows that the best an author can realistically hope for in the first round is an invitation to revise and resubmit, though a first-round conditional acceptance is possible (we reached two of them this year). Clearly, the most frequent first-round outcome is a rejection. As stated in *TAR*'s standard rejection-letter wording, a first-round rejection is intended in the best interest of all parties, avoiding the even-worse outcome of a multiple-round rejection.

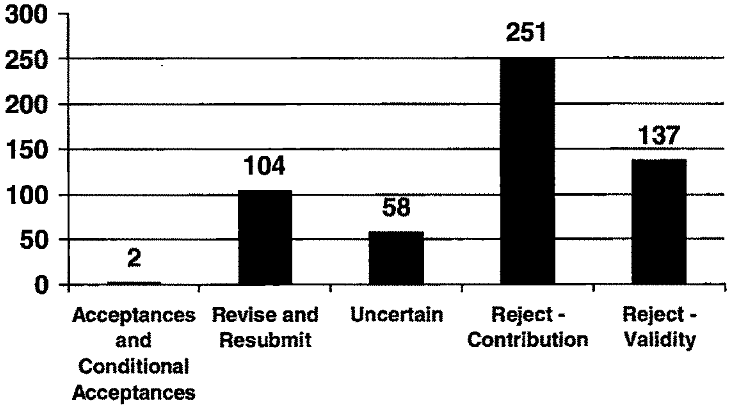
Panels B and C of Chart 1 show that the likelihood of a favorable outcome increases dramatically in the second round and beyond, though there are no guarantees. We certainly try to avoid the "disaster scenario" of a fourth-round rejection, though this did happen twice in 2009. To reiterate a point from Section II, the primary reason why the likelihood of acceptance goes up so dramatically for revisions is that my co-editors and I invite revision of only those manuscripts perceived to have the most potential (with the exception of manuscripts logged in the "uncertain" category). We simply cannot entertain revisions of rejected manuscripts unless the new paper clearly reports the results of a new study. I view this policy as being in author(s)' best interests, to the extent that it is worthwhile to minimize the frequency of multiple-round rejections.

Table 3: Submissions and Acceptances by Area and Research Method

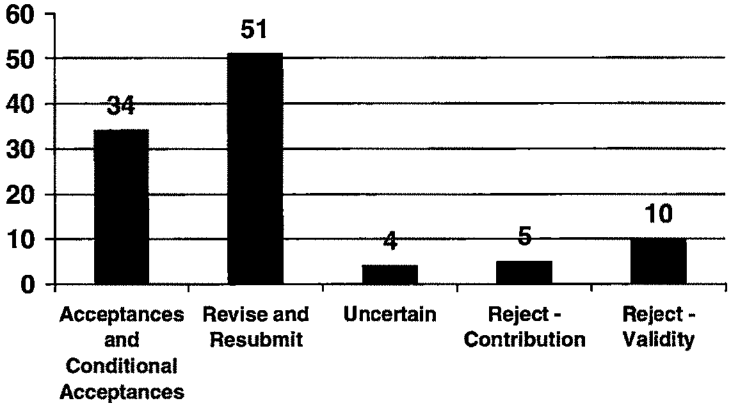
Several authors (e.g., Bonner et al. 2006; Heck and Jensen 2007; Hopwood 2007; Tuttle and Dillard 2007) have lamented the perceived narrowness of contemporary accounting scholarship, mostly with respect to the perception that the discipline is "consolidating around the area of financial accounting" (Tuttle and Dillard 2007, 395), particularly of the empirical-archival "capital markets" variety. Writings of this nature generally imply (if not explicitly state) that accounting journals and editorial biases are part of the problem. However, journals can only publish what they receive, such that a more comprehensive analysis compels consideration of both articles published and the underlying submission base rates. Former AAA President Shyam Sunder told me once that journals are intellectual mirrors of the scholarly communities they reflect. Table 3 attempts to put Professor Sunder's mirror

CHART 1
Histogram of Editorial Rounds and Outcomes
Journal Year Ending May 31, 2009

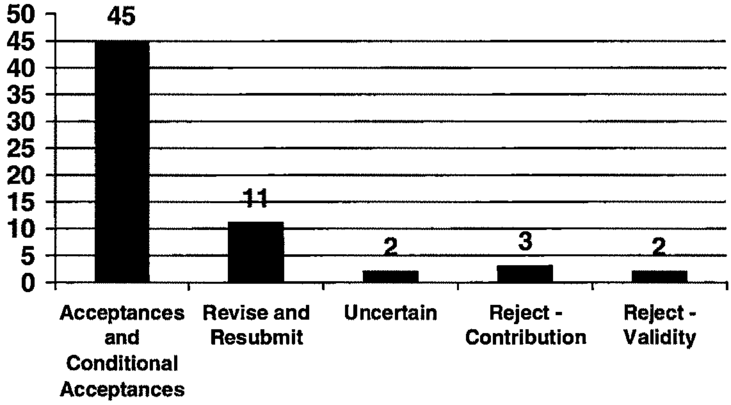
Panel A: First-Round Outcomes (New Submissions)



Panel B: Second-Round Outcomes (First Revisions)



Panel C: Third- and Fourth-Round Outcomes (Second and Third Revisions)



metaphor to the test, at least for *The Accounting Review*, reporting submission and acceptance rates by area and by method to see whether *TAR*'s mirror reflects accurately or is warped by editorial biases.

Table 3 reports fiscal 2009 submission and acceptance statistics by topic in Panel A and by method in Panel B, using the topical and methodological categories requested by the AAA Publications Committee. For each submission received during the year (but without double counting revisions of manuscripts already logged), I determined and my assistant, Mary Capps, recorded the manuscript's primary topic and method. To be sure, some manuscripts overlapped categories and required judgment, but I did my best to log the topic and method most closely reflecting the manuscript's primary research objective. Table 3

TABLE 3
Submissions and Acceptances by Subject Area and Research Method
Journal Year Ending May 31, 2009

Panel A: Submissions and Acceptances by Subject Area

Primary Subject Area (a)	Submissions Representing Unique Manuscript Files with Decisions (b)	Percentage of Total Submissions (c)	Acceptances and Conditional Acceptances (d)	Percentage of Total Acceptances (e)
Auditing	132	20.4%	19	23.5%
Financial	337	52.2%	38	46.9%
Governmental and Not-for-Profit	11	1.7%	1	1.2%
International	24	3.7%	2	2.5%
Managerial	82	12.7%	13	16.0%
Systems	16	2.5%	3	3.7%
Taxation	35	5.4%	5	6.2%
Other	9	1.4%	0	0.0%
Total	646	100.0%	81	100.0%

Panel B: Submissions and Acceptances by Method

Primary Research Method (a)	Submissions Representing Unique Manuscript Files with Decisions (b)	Percentage of Total Submissions (c)	Acceptances and Conditional Acceptances (d)	Percentage of Total Acceptances (e)
Analytical	54	8.4%	11	13.6%
Empirical-Archival	476	73.7%	53	65.4%
Experimental	89	13.8%	11	13.6%
Field and Case Study	7	1.1%	0	0.0%
Survey	15	2.3%	5	6.2%
Other	5	0.8%	1	1.2%
Total	646	100.0%	81	100.0%

(*continued on next page*)

TABLE 3 (continued)

Panel C: Submissions and (Acceptances) by Topic Crossed with Method

Subject and Method	Auditing	Financial	Managerial	Taxation	All Other Subjects	Total
Analytical	8 (2) 1% (3%)	24 (5) 4% (6%)	14 (3) 2% (4%)	5 (1) 1% (1%)	3 (0) < 1% (0%)	54 (11) 8% (14%)
Empirical-Archival	87 (13) 14% (16%)	284 (28) 44% (35%)	35 (5) 5% (6%)	29 (4) 4% (5%)	41 (3) 6% (4%)	476 (53) 74% (65%)
Experimental	34 (3) 5% (4%)	24 (3) 4% (4%)	20 (3) 3% (4%)	1 (0) < 1% (0%)	10 (2) 2% (2%)	89 (11) 14% (14%)
All Other Methods	3 (1) < 1% (1%)	5 (2) 1% (2%)	13 (2) 2% (2%)	0 (0) 0% (0%)	6 (1) 1% (1%)	27 (6) 4% (7%)
Total	132 (19) 20% (24%)	337 (38) 52% (47%)	82 (13) 13% (16%)	35 (5) 5% (6%)	60 (6) 9% (7%)	646 (81) 100%

In Panels A and B:

(a) Subject (Panel A) and method (Panel B) categories are as directed by the AAA Publications Committee. Manuscripts that overlapped categories were assigned to the category best capturing the study's primary objective, as judged by the Senior Editor.

(b) This column reflects the 646 unique manuscript files obtained by taking the 719 editorial decisions during the fiscal year as tallied in Table 1, Panel A and subtracting the 73 revise-and-resubmit decisions on manuscripts for which a subsequent decision was logged within the same fiscal year on the same file, thereby avoiding double counting of categories for the same manuscript files.

(c) This column represents the entry in Column (b) divided by 646 unique manuscript files.

(d) This column reflects the 81 acceptance and conditional acceptance decisions reached on the 646 unique manuscript files in Column (b).

(e) This column represents the entry in Column (d) divided by 81 acceptances and conditional acceptances.

In Panel C:

Cell entries reflect submissions first, then acceptances (in parentheses). The top row for each cell indicates raw counts. The bottom row computes percentages of the 646 total unique submissions and 81 total acceptances, respectively, rounded to the nearest whole percentage to enable the table to fit in the available space.

reports only those submissions for which decisions were reached during the fiscal year ending May 31, 2009 (i.e., 646 unique manuscript files).

By far, the most frequent topical area is financial accounting and the most frequent method is empirical-archival (i.e., mostly "capital markets," though I should hasten to acknowledge that financial-archival studies do not necessarily involve market data). The important observation, however, is that the high frequency of financial-archival research characterizes both submissions (52.2 percent financial and 73.7 percent archival) and acceptances (46.9 percent financial and 65.4 percent archival). In fact, the *TAR* acceptance bias, if any, seems to be slightly ***against*** financial-archival research. That said, my perspective as a researcher compels me to disclose that a contingency table analysis fails to reject the null hypothesis of equivalent submission and acceptance percentage frequencies by topical category ($\chi^2_{df=7} = 3.35$; $p > 0.50$) or by method ($\chi^2_{df=5} = 7.81$; $p = 0.17$).[3] I was surprised at just how closely the acceptance percentages track the submissions percentages, even without any "quotas" to manage acceptances by category. And lest the reader infer that the data reported in Table 3 reflect changes in editorial policy, I conducted a less formal analysis of *TAR* acceptances and submissions from 2004 to 2007 before I became senior editor (with thanks to the former editorial regime for giving me the data), reaching similar conclusions.

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[3] Concerned that small cell sizes in the less frequent categories might be distorting the statistics, I repeated both the topical and methodological contingency table analyses after combining the "governmental/NFP," "international," "systems," and "other" topics into a combined "other" topical category and after combining the "field/case," "survey," and "other" methods into a combined "other" methodological category. Results continue to fail to reject the null hypothesis of equivalent submission and acceptance percentages for both topical categories ($\chi^2_{df=4} = 1.68$; $p > 0.50$), and methodological categories ($\chi^2_{df=3} = 4.52$; $p = 0.21$).

To offer a more specific categorization than that requested by the Publications Committee, Panel C of Table 3 matches the topical categories with the methodological categories. With no offense intended to those who conduct research on governmental/NFP, international, or systems topics or those who use field/case or survey methods, Panel C consolidates combinations involving these categories into "other" due to the very low (and sometimes zero) cell sizes that otherwise result from combining topics with methods. The reader can form his/her own interpretations of the data in Table 3, Panel C. My interpretation is that the high frequency of financial/archival articles in *TAR* has a simple explanation: *TAR* receives lots of financial/archival submissions.

These data should not be taken to imply that all is well with the discipline. Perhaps it is indeed the case that accounting as a discipline is consolidating too much around financial accounting, to repeat the excerpt from Tuttle and Dillard (2007). Dissertation statistics, for example, are revealing: Tuttle and Dillard (2007, 400) report that the percentage of accounting dissertations on financial topics increased from 38 percent in 1995 to 70 percent in 2005. My point is not to take a position on whether this trend is healthy or unhealthy. Rather, the more modest message of Table 3 is that, if financial accounting is dominating, something other than editorial bias at *The Accounting Review* is the reason. Revisiting Sunder's mirror metaphor, *TAR*'s mirror seems reasonably accurate. It is up to the community to determine what gets reflected.

Table 4: Author Affiliations

Swanson et al. (2007) report research expressing the concern that journal articles in accounting are more concentrated among a narrower set of universities than research in other disciplines. The Publication Committee's request for the data reported in Table 4 reflects an attempt to gauge *TAR*'s diversity, both across schools and internationally. Panel A of Table 4 tallies the number of articles corresponding to each university for which at least one (co)author published an article among the 65 refereed articles in Volume 84 of *TAR* (i.e., calendar 2009). Articles written by *k* coauthors are attributed $1/k$ to each author's affiliation, and if an author lists two affiliations, then half of that author's $1/k$ share is allocated to each affiliation. Because it seems marginally more interesting than alphabetical order, I list the institutions in Table 4, Panel A in descending order of the number of articles published. However, I strongly urge the reader to resist the temptation to view Panel A as yet another university-ranking exercise. First, it reflects only one year of data. But more fundamentally, the broader point of Panel A is not that the University of Pennsylvania leads the pack with 2.42 articles (which is only 3.7 percent of the total, by the way). Rather, the primary message of Table 4, Panel A is that 85 universities and other institutions appeared at least once in a 2009 issue of *TAR*. I submit that this is a relatively diverse representation.

Table 4, Panel B reports data on international diversity. Specifically, Panel B tallies the 646 submissions for which *TAR* reached a decision during the fiscal year on unique manuscript files (i.e., without double counting any manuscripts with multiple submissions during the year due to one or more revisions) and the 81 acceptances or conditional acceptances reached in fiscal 2009, dividing each category into U.S. and non-U.S. authors (allocating $1/k$ credit to each of *k* coauthors). Panel B indicates that non-U.S. authors accounted for

TABLE 4
Author Affiliation

Panel A: Universities and Other Institutions Represented in Volume 84 (Calendar 2009)

Author Affiliation	Number of Published Articles (Vol. 84, 2009)
University of Pennsylvania	2.42
The University of Iowa	2.25
Harvard University	2.17
Michigan State University	2.17
Stanford University	2.00
The University of New South Wales	1.83
University of Toronto	1.75
University of Illinois at Urbana–Champaign	1.67
University of Pittsburgh	1.67
University of California, Berkeley	1.50
Indiana University	1.50
Singapore Management University	1.50
The George Washington University	1.33
University of Michigan	1.33
Texas A&M University	1.33
University of Wisconsin–Madison	1.33
University of Minnesota	1.25
Brigham Young University	1.17
University of Southern California	1.17
The University of Texas at Dallas	1.17
Universidad Carlos III de Madrid	1.00
Georgia Institute of Technology	1.00
Humboldt University–Berlin	1.00
Iowa State University	1.00
McGill University	1.00
University of Melbourne	1.00
University of Rochester	1.00
Washington University at St. Louis	1.00
Hong Kong University of Science and Technology	0.83
The University of Chicago	0.83
Florida International University	0.83
Maastricht University	0.83
University of Missouri–Columbia	0.83
The University of Utah	0.83
University of California, Irvine	0.75
The Pennsylvania State University	0.67
Rice University	0.67
University of South Florida	0.67
University of Virginia	0.67
University of Connecticut	0.58

(*continued on next page*)

TABLE 4 (continued)

Author Affiliation	Number of Published Articles (Vol. 84, 2009)
University of Notre Dame	0.58
The University of Oklahoma	0.58
University of Amsterdam	0.50
Bentley University	0.50
Columbia University	0.50
Cornell University	0.50
University of Florida	0.50
Goethe University	0.50
University of Houston	0.50
The University of Texas at Austin	0.50
Utah State University	0.50
Washington State University	0.50
University of Waterloo	0.50
University of Antwerp	0.33
Arizona State University	0.33
University of Auckland	0.33
University of California, Davis	0.33
University of California, Los Angeles	0.33
University of California, San Diego	0.33
Colorado State University	0.33
Duke University	0.33
HEC Paris	0.33
Meijo University	0.33
Nanyang Technological University	0.33
University of Nevada, Las Vegas	0.33
New York University	0.33
The University of North Carolina at Chapel Hill	0.33
Northeastern University	0.33
Osaka University of Economics	0.33
Syracuse University	0.33
The University of Tennessee	0.33
Ball State University	0.25
University of British Columbia	0.25
Chapman University	0.25
University of Hong Kong	0.25
Indian School of Business	0.25
Kent State University	0.25
Seoul National University	0.25
Barclays Global Investors	0.17
Copenhagen Business School	0.17
Interdisciplinary Center–Herzliya	0.17
Massachusetts Institute of Technology	0.17
University of Southern Maine	0.17

(*continued on next page*)

TABLE 4 (continued)

Author Affiliation	Number of Published Articles (Vol. 84, 2009)
Concordia University	0.13
Hong Kong Polytechnic University	0.13

Panel B: U.S. and Non-U.S. Affiliations for the Journal Year Ending May 31, 2009

	Submissions Representing Unique Manuscript Files with Decisions		Acceptances and Conditional Acceptances	
	Number	Percentage	Number	Percentage
U.S. Institutions	483.18	74.8%	65.16	80.4%
Non-U.S. Institutions	162.82	25.2%	15.84	19.6%

Panel A reports author affiliations for the 65 refereed articles published in Volume 84 of *The Accounting Review*, excluding four invited commentaries. For articles written by k coauthors, the table allocates $1/k$ of an article to each coauthor's affiliation. For authors indicating two affiliations, that author's $1/k$ share is allocated equally to both affiliations.

Panel B reports data for authors' affiliations, allocating $1/k$ of each manuscript to each of k coauthors. Submissions data reflect the 646 unique files obtained by taking the 719 editorial decisions during the fiscal year as tallied in Table 1, Panel A, and subtracting 73 revise-and-resubmit decisions on manuscripts for which a subsequent decision was logged within the same fiscal year on the same file, thereby avoiding double counting of the same manuscript files. Acceptance data reflect all 81 acceptances and conditional acceptances reached in the journal year ending May 31, 2009, including acceptances reserved for publication in 2010.

25.2 percent of submissions and 19.6 percent of acceptances. The lower frequency of non-U.S. acceptances relative to submissions is marginally significant using Fisher's Exact Test ($p = 0.063$). I hesitate to offer interpretations (if indeed the difference of 5.6 percent is meaningful), as I have no rigorous evidence to back any such interpretations. My strong sense, however, is that any lower frequency of non-U.S. acceptances likely reflects correlated factors rather than overt bias against non-U.S. authors. And to look at the situation from the "glass half full" perspective, I believe it is noteworthy that approximately one out of five successful *TAR* authors is from a non-U.S. institution.

Table 5: Processing Time

Table 5, Panel A provides processing time data for the 719 decisions reached from June 1, 2008 through May 31, 2009, defining "processing time" as the number of days from the submission to the date my assistant, Mary Capps, sends the decision letter. The reader will see that roughly two-thirds of the decisions were reached within three months of submission, though, of course, this means that one-third were in process more than three months. Certainly my goal is for *TAR* to send a decision letter within three months of submission, and I was somewhat disappointed in our mean processing time of 81 days, wishing that it was closer to 60 or 70.

As partial explanation, some manuscripts caught in the editorial transition at June 1, 2008 tended to experience longer turnaround times. Table 5, Panel B (supplemental) reports similar data as Panel A, after deleting the 133 manuscripts submitted before June 1, 2008 that were in process on the date of the editorial transition. Panel B reports a lower mean for post-6/1/08 submissions (73 days), with 74.1 percent of decisions reached within

TABLE 5
Processing Time from Date of Submission to Date of Sending the Decision Journal Year Ending May 31, 2009

Panel A: All 719 Decisions Reached in the Journal Year Ending May 31, 2009

Processing Time	Number of Manuscripts	Percentage	Cumulative Number of Manuscripts	Cumulative Percentage
≤30 days	74	10.3%	74	10.3%
31–60 days	88	12.2%	162	22.5%
61–90 days	310	43.1%	472	65.6%
91–120 days	167	23.2%	639	88.9%
≥121 days	80	11.1%	719	100.0%

Mean processing time: 81 days.
Median processing time: 81 days.

Panel B: Decisions on All Submisions Received from June 1, 2008–May 31, 2009

Processing Time	Number of Manuscripts	Percentage	Cumulative Number of Manuscripts	Cumulative Percentage
≤30 days	73	12.5%	73	12.5%
31–60 days	80	13.7%	153	26.1%
61–90 days	281	48.0%	434	74.1%
91–120 days	125	21.3%	559	95.4%
≥121 days	27	4.6%	586	100.0%

Mean processing time: 73 days.
Median processing time: 79 days.
Panel B excludes 133 in-process post-June 1, 2008 decisions on manuscripts that were submitted before June 1, 2008, the first day of the new editorial regime.

three months of submission and 95.4 percent of decisions reached within four months of submission.

Serving as senior editor tends to confer a somewhat different perspective with respect to processing times. Clearly the easiest way to improve our turnaround times would be to desk reject more manuscripts, but that would hardly seem a beneficial change from the Association's perspective. This observation reveals the overwhelming reason for late decisions: late reviewers. My assistant, Mary Capps, sends the usual reminders, but sometimes these are of little avail. A journal governed by the community is at the mercy of the community.

At the onset of my editorship, I vowed to reach a decision with one review if both reviews were not in hand at the two-month point. This intent, however, proved easier to utter than to implement. Late reviewers will usually promise the late review within just a couple more weeks, and then a week after that, and so forth. Moreover, if the one review in hand recommends rejection, would the author rather we reach a decision with one review or wait two more weeks in hopes of getting a second opinion? Let us face facts. Experienced reviewers (and editors) are busy people. We do the best we can, but universities confer multiple demands that stretch our resources thin from time to time. These observations should not be taken as an attempt to rationalize late reviews or late decisions. If we like to receive a decision within three months after submission as authors, then we should keep that expectation in mind when serving as reviewers (noting further that the editor will need some time to form a decision). The broader point, however, is that a few four-month processing times will invariably characterize a peer-reviewed journal. All we can do is to try to keep those cases to a minimum.

IV. GIVING CREDIT WHERE CREDIT IS DUE

Though not requested by the Publications Committee, I feel compelled to close this report with some notes of thanks. First, I am grateful to my outstanding assistants: *TAR* Editorial Assistant Mary Capps and University of Texas at Austin accounting doctoral student (and *TAR* Research Assistant) Tracie Majors. Mary, Tracie, and I meet every weekday at 2:00 PM to discuss that day's workflow (and any "fires" that need extinguishing). They work tirelessly, and their work never ends. I could not do this job without them.

Second, I thank my co-editors, Shannon Anderson, Harry Evans, Jim Hunton, Kathryn Kadous, Sanjay Kallapur, Ranjani Krishnan, Laureen Maines, Paul Newman, Tom Omer, Wayne Thomas, Mark Trombley, Beverly Walther, and Paul Zarowin. I believe (and I hope they agree) that I have developed 13 valued friendships through my associations with these outstanding professionals, and I am tremendously grateful for their willingness to help me share the load. There is no possible way that I could reach 719 decisions in a year on my own.

Third, I thank *TAR*'s Editorial Advisory and Review Board, as listed in the inside cover material of each issue. They carry the lion's share of the review workload (each generally completing six and often more reviews per year), and they usually do so with a smile, even if a *TAR* editor is forced in the awkward position of rejecting a Board member's paper one day and requesting a review from that same Board member the next day. I am inspired by the constructiveness and professionalism of these outstanding scholars. Proving that no good deed goes unpunished, that is why they get so many review requests.

Fourth, even with 124 Editorial Board members, *TAR* could not possibly manage (certainly not with a two-reviewer system) without the extensive assistance of *ad hoc* reviewers. These reviewers are the unsung heroes of the process, and they too often go unthanked. Accordingly, I am listing them by name, and it is my intent to do so each year I submit this report. Please see Appendix B for the many well-qualified experts who have served as *ad hoc* reviewers from June 1, 2008 to May 31, 2009. *TAR* owes them a huge debt of gratitude.

Fifth, I thank former *TAR* Senior Editor Dan Dhaliwal and his co-editors, both for their dedicated service to the AAA, and for making the editorial transition smooth and straightforward. I thank former Editorial Assistant Gail Fey for teaching us the "system." All members of the former regime have been very helpful and cooperative throughout the process.

Finally, on a personal note, I thank Paula, my wonderful wife of 25 years (and counting). As I am typing this paragraph, I see that the evening hours have arrived (on a Friday evening no less), but Paula will understand, and she will also understand why I have to write decision letters on Saturday and Sunday instead of installing the deck lighting I promised her two (she says three) months ago. I also thank my three super daughters, Karen, Nicole, and Sara, for being equally understanding. Karen and Nicole are both undergraduates at The University of Texas at Austin (they live in the dorms), and they are kind enough to have lunch with Dad once a week to give me some relief from the emails. My 14-year-old Sara lives at home, and like her Mom, is so understanding when Dad gets behind due to that "magazine" he has to do. I take my *TAR* responsibilities very seriously, but my family helps to keep me from taking myself too seriously. It is helpful for all involved in the process—authors, reviewers, and editors—to remind ourselves from time to time that accounting research does not exactly cure cancer. If journals publish interesting research that facilitates a richer understanding of accounting and more effective accounting education, that is all we can ask. But there are more important things in life, such as family. Next week I am taking mine to the Great Smoky Mountains for a few days of tent camping, rest, relaxation, and fun. This family time will undoubtedly delay some decision letters for a week or so, but I hope the authors understand.

APPENDIX A
TAR Review Form

Note: This Appendix reproduces the content of the Review Form *TAR* sends with each review request. To save space, the material below is not the literal form, as the electronic form provides buttons to check one of the recommendation options (page 1) and spaces for written answers to the open-ended questions (page 2). However, the questions asked on the form are exactly as indicated below.

This form summarizes information that would ordinarily be conveyed in a cover letter to the editor, and hence eliminates the need for a separate cover letter.

1. Overall recommendation: Please select the category that best captures your recommendation to the editor.
    - ○ **CONDITIONAL ACCEPT:** The manuscript's incremental contribution is sufficient to warrant consideration for publication in *The Accounting Review*, subject to satisfactorily addressing any suggestions/concerns in the review report.
    - ○ **REVISE AND RESUBMIT:** Significant concerns raise doubt about the manuscript's incremental contribution, but the study offers a reasonable potential that those concerns could be remedied in a diligent revision.
    - ○ **UNCERTAIN:** Significant concerns raise doubt about the manuscript's incremental contribution, and it is unclear whether even a diligent revision could remedy those concerns. NOTE: This category provides the least guidance to the editor and author(s), and hence should be used only in (ideally rare) cases in which it is genuinely unclear whether the manuscript offers sufficient potential to warrant an invitation to revise and resubmit.
    - ○ **REJECT DUE TO INSUFFICIENT CONTRIBUTION:** The manuscript's incremental contribution is of insufficient magnitude to warrant publication in *The Accounting Review*, and likely cannot be made sufficient short of a new study (as opposed to a revision of the current effort).
    - ○ **REJECT DUE TO VALIDITY THREAT:** Significant concerns threaten the validity of the claimed contribution, and addressing those concerns would effectively require a new study (as opposed to a revision of the current effort).
2. In one or two sentences, please summarize the primary contribution made by the study under review.

3. In one or two sentences, please summarize the most important concern with this manuscript.

4. Please use this space for any other information you wish to convey directly to the editor.

Thank you for reviewing this manuscript. *The Accounting Review* cannot succeed without the help of dedicated expert reviewers, and we are most appreciative for your willingness to serve in this capacity.

APPENDIX B
TAR Ad Hoc Reviewers
June 1, 2008–May 31, 2009

Note: This table lists all *ad hoc* reviewers who submitted at least one review report between June 1, 2008 and May 31, 2009. It does not include the 124 members of the Editorial Advisory and Review Board, as these names are listed separately in the inside cover material of each issue. *Ad hoc* reviewers whose reports were submitted after May 31, 2009 will be listed in next year's report.

Jeffrey S. Abarbanell, The University of North Carolina at Chapel Hill
Lawrence J. Abbott, The University of Memphis
Margaret A. Abernethy, University of Melbourne
David Aboody, University of California, Los Angeles
Lucy Ackert, Kennesaw State University
Christopher P. Agoglia, University of Massachusetts Amherst
Michael G. Alles, Rutgers University
Jennifer L. M. Altamuro, The Ohio State University
Eli Amir, London Business School
Urton L. Anderson, The University of Texas at Austin
Christopher S. Armstrong, University of Pennsylvania
Sharad C. Asthana, The University of Texas at San Antonio
Mark Bagnoli, Purdue University
Bok Baik, Seoul National University
Wendy J. Bailey, University of South Carolina
Sudhakar Balachandran, Columbia University
Steven Balsam, Temple University
E. Michael Bamber, The University of Georgia
Ran Barniv, Kent State University
Jan J. Barton, Emory University
Eli Bartov, New York University
Sudipta Basu, Temple University
Mark S. Beasley, North Carolina State University
Paul J. Beck, University of Illinois at Urbana–Champaign
Joy Begley, University of British Columbia
Bruce K. Behn, The University of Tennessee

Messod D. Beneish, Indiana University
Daniel A. Bens, The University of Arizona
Sreedhar Bharath, University of Michigan
Neil Bhattacharya, Southern Methodist University
Sanjeev Bhojraj, Cornell University
Bruce K. Billings, Florida State University
Ervin L. Black, Brigham Young University
Sarah E. Bonner, University of Southern California
A. Faye Borthick, Georgia State University
Christine A. Botosan, The University of Utah
Jan Bouwens, Tilburg University
Kendall Bowlin, The University of Mississippi
Bruce C. Branson, North Carolina State University
Joseph F. Brazel, North Carolina State University
Stephen H. Bryan, Wake Forest University
Jorg Budde, University of Bonn
David C. Burgstahler, The University of Washington
Jeffrey J. Burks, University of Notre Dame
Robert Bushman, The University of North Carolina at Chapel Hill
Donal A. Byard, Baruch College–CUNY
Steven F. Cahan, University of Auckland
Dennis Campbell, Harvard University
Eddy Cardinaels, Tilburg University
Peter Carey, Monash University
Tina D. Carpenter, The University of Georgia
Elizabeth Carson, The University of New South Wales
Gavin Cassar, University of Pennsylvania
Jeffrey R. Casterella, Colorado State University
Marcus L. Caylor, University of South Carolina
Sandra L. Chamberlain, University of British Columbia
Dennis J. Chambers, University of Kentucky
Derek K. W. Chan, The University of Hong Kong
Kevin C. W. Chen, Hong Kong University of Science and Technology
Peter F. Chen, Honk Kong University of Science and Technology
Shuping Chen, The University of Texas at Austin
Ting Chen, Baruch College–CUNY
Xia Chen, University of British Columbia
C. S. Agnes Cheng, Louisiana State University
Shijun Cheng, University of Maryland
Edwige Cheynel, Carnegie Mellon University
Jong-Hag Choi, Seoul National University
Margaret H. Christ, The University of Georgia
Peter Christensen, Aarhus University
Theodore E. Christensen, Brigham Young University
Hyeesoo (Sally) Chung, Arizona State University West
Peter M. Clarkson, University of Queensland
Shana M. Clor-Proell, University of Wisconsin–Madison
Daniel A. Cohen, New York University

Jeffrey R. Cohen, Boston College
Daniel W. Collins, The University of Iowa
Carlos Corona, The University of Texas at Austin
Andrew D. Cuccia, The University of Oklahoma
Asher Curtis, The University of Utah
Julia M. D'Souza, Cornell University
Masako N. Darrough, Baruch College–CUNY
Somnath Das, University of Illinois at Chicago
Sudipto Dasgupta, Hong Kong University of Science and Technology
Angela K. Davis, University of Oregon
Anja De Waegenaere, Tilburg University
Douglas V. DeJong, The University of Iowa
Henri C. Dekker, Vrije University Amsterdam
Joel S. Demski, University of Florida
Christine Denison, Iowa State University
Aiyesha Dey, The University of Chicago
Ilia D. Dichev, Emory University
J. Richard Dietrich, The Ohio State University
Shane S. Dikolli, Duke University
Ming Dong, York University
Jeffrey T. Doyle, Utah State University
Andrea R. Drake, Louisiana Tech University
Cindy Durtschi, DePaul University
Augustine Duru, American University
Ronald A. Dye, Northwestern University
Scott D. Dyreng, Duke University
Michael J. Eames, Santa Clara University
Christine E. Earley, Providence College
Frank Ecker, Duke University
Eti Einhorn, Tel Aviv University
Randal J. Elder, Syracuse University
Pieter T. Elgers, University of Massachusetts Amherst
W. Brooke Elliott, University of Illinois at Urbana–Champaign
Kirsten M. Ely, Sonoma State University
Merle M. Erickson, The University of Chicago
Yonca Ertimur, Duke University
Michael L. Ettredge, The University of Kansas
Ralf Ewert, University of Graz
Qintao Fan, University of California, Berkeley
Anne M. Farrell, University of Illinois at Urbana–Champaign
C. Edward Fee, Michigan State University
William L. Felix, Jr., The University of Arizona
Mei Feng, University of Pittsburgh
Andrew Ferguson, University of Technology Sydney
Daniel Ferreira, London School of Economics
Fabrizio Ferri, Harvard University
Laura Casares Field, The Pennsylvania State University
Joseph G. Fisher, Indiana University

George Foster, Stanford University
Mary Margaret Frank, University of Virginia
Richard M. Frankel, Washington University at St. Louis
Hans Frimor, Aarhus University
Jon A. Garfinkel, The University of Iowa
Jennifer J. Gaver, The University of Georgia
Weili Ge, The University of Washington
Marshall A. Geiger, University of Richmond
Aloke Ghosh, Baruch College–CUNY
Dipanker Ghosh, The University of Oklahoma
Stuart Gillan, Texas Tech University
Dan Givoly, The Pennsylvania State University
Guojin Gong, The Pennsylvania State University
Elizabeth Gordon, Rutgers University
Angela K. Gore, The George Washington University
Severin V. Grabski, Michigan State University
Jeffery D. Gramlich, University of Southern Maine
Audrey A. Gramling, Kennesaw State University
Barbara Murry Grein, Drexel University
Paul A. Griffin, University of California, Davis
Zhaoyang Gu, University of Minnesota
Wayne R. Guay, University of Pennsylvania
Ilan Guttman, Stanford University
Susan F. Haka, Michigan State University
Sophia Hamm, University of Pennsylvania
Jackie S. Hammersley, The University of Georgia
Jun Han, The University of Hong Kong
Michelle Hanlon, University of Michigan
Rebecca N. Hann, University of Southern California
J. Douglas Hanna, Southern Methodist University
Jay C. Hartzell, The University of Texas at Austin
John M. Hassell, Indiana University–Indianapolis
Richard C. Hatfield, The University of Alabama
In-Mu Haw, Texas Christian University
Carla K. Hayn, University of California, Los Angeles
Paul M. Healy, Harvard University
Frank L. Heflin, Florida State University
Shane M. Heitzman, University of Rochester
Thomas Hemmer, University of Houston
William G. Heninger, Brigham Young University
Karen Hennes, The University of Oklahoma
Max Hewitt, Indiana University
Gilles Hilary, HEC Paris
Stephen A. Hillegeist, INSEAD
Jessen Hobson, Florida State University
Leslie D. Hodder, Indiana University
Vicky B. Hoffman, University of Pittsburgh
Rani Hoitash, Bentley University

Udi Hoitash, Northeastern University
Ole-Kristian Hope, University of Toronto
Patrick E. Hopkins, Indiana University
Keith Houghton, Australian National University
S. Paul Hribar, The University of Iowa
John S. Hughes, University of California, Los Angeles
K. E. [Skip] Hughes II, Louisiana State University
Ming Yi Hung, University of Southern California
Amy Hutton, Boston College
Lee-Seok Hwang, Seoul National University
Yuchang Hwang, Arizona State University
Paul J. Irvine, The University of Georgia
Scott B. Jackson, University of South Carolina
Alan Jagolinzer, Stanford University
Karim Jamal, University of Alberta
Surya N. Janakiriman, The University of Texas at Dallas
Nicole T. Jenkins, Vanderbilt University
Ross G. Jennings, The University of Texas at Austin
Kevan L. Jensen, The University of Oklahoma
Debra C. Jeter, Vanderbilt University
John (Xuefeng) Jiang, Michigan State University
W. Bruce Johnson, The University of Iowa
Derek Johnston, Colorado State University
Rick M. Johnston, The Ohio State University
Christopher L. Jones, The George Washington University
Peter R. Joos, Morgan Stanley
Bjorn N. Jorgensen, Columbia University
Philippe Jorion, University of California, Irvine
Christine Jubb, Australian National University
Sok-Hyon Kang, The George Washington University
Tony Kang, Florida Atlantic University
Steven E. Kaplan, Arizona State University
Christo Karuna, University of California, Irvine
Ron Kasznik, Stanford University
Sharon P. Katz, Harvard University
Elizabeth K. Keating, Boston College
Deen Kemsley, Tulane University
Mozaffar Khan, Massachusetts Institute of Technology
Emre Kilic, University of Houston
Myung-Sun Kim, University at Buffalo, SUNY
Oliver Kim, University of Maryland
Michael R. Kinney, Texas A&M University
William R. Kinney, Jr., The University of Texas at Austin
Michael T. Kirschenheiter, University of Illinois at Chicago
Kenneth J. Klassen, University of Waterloo
W. Robert Knechel, University of Florida
Gopal V. Krishnan, Lehigh University
Jagan [Krish] Krishnan, Temple University

Linda K. Krull, University of Oregon
Xi (Jason) Kuang, Georgia Institute of Technology
Susan Cohen Kulp, The George Washington University
Krishna R. Kumar, The George Washington University
Ryan LaFond, Barclays Global Investors
Wayne R. Landsman, The University of North Carolina at Chapel Hill
Mark H. Lang, The University of North Carolina at Chapel Hill
Stacie Kelley Laplante, The University of Georgia
Volker Laux, The University of Texas at Austin
Craig E. Lefanowicz, University of Virginia
Reuven Lehavy, University of Michigan
Andrew J. Leone, University of Miami
Christian Leuz, The University of Chicago
Edward X. Li, University of Rochester
Feng Li, University of Michigan
Oliver Zhen Li, The University of Arizona
Xu Li, The University of Texas at Dallas
Pierre Jinghong Liang, Carnegie Mellon University
Theresa Libby, Wilfred Laurier University
Anne M. Lillis, University of Melbourne
Steve C. Lim, Texas Christian University
Robert C. Lipe, University of Oklahoma
Chao-Shin Liu, University of Notre Dame
Jing Liu, University of California, Los Angeles
Joshua Livnat, New York University
Kin Lo, University of British Columbia
Mark Loewenstein, University of Maryland
Thomas J. Lopez, University of South Carolina
Barbara A. Lougee, University of San Diego
Tim Loughran, University of Notre Dame
Henock Louis, The Pennsylvania State University
Michelle Lowry, The Pennsylvania State University
Yvonne Lu, University of Southern California
Russell J. Lundholm, University of Michigan
Antoinette L. Lynch, Florida International University
Luann J. Lynch, University of Virginia
Michael W. Maher, University of California, Davis
Mario J. Maletta, Northeastern University
David Manry, University of New Orleans
Roger D. Martin, University of Virginia
Michal Matějka, University of Michigan
Ella Mae Matsumura, University of Wisconsin–Madison
Steven R. Matsunaga, University of Oregon
William J. Mayew, Duke University
Cheri L. Mazza, Fordham University
Mary Lea McAnally, Texas A&M University
Annie S. McGowan, Texas A&M University
John McInnis, The University of Texas at Austin

James C. McKeown, The Pennsylvania State University
Maureen F. McNichols, Stanford University
Krishnagopal Menon, Boston University
Molly Mercer, Arizona State University
William F. Messier, Jr., University of Nevada, Las Vegas
Brian Paul Miller, Indiana University Bloomington
Bruce L. Miller, University of California, Los Angeles
Jeffrey S. Miller, University of Notre Dame
Birendra K. Mishra, University of California, Riverside
H. Fred Mittelstaedt, University of Notre Dame
Stephen R. Moehrle, University of Missouri–St. Louis
Frank Moers, Maastricht University
Steven J. Monahan, INSEAD
Kimberly K. Moreno, Northeastern University
Richard M. Morton, Florida State University
Karl Muller, The Pennsylvania State University
Uday S. Murthy, University of South Florida
Linda A. Myers, University of Arkansas
Nandu J. Nagarajan, University of Pittsburgh
Dhananjay [DJ] Nanda, University of Miami
V. G. Narayanan, Harvard University
Gordian A. Ndubizu, Drexel University
Mark W. Nelson, Cornell University
Christine Nolder, Bentley University
David S. North, University of Richmond
John R. O'Brien, Carnegie Mellon University
Maria Ogneva, Stanford University
Suil Pae, Sungkyunkwan University
Chul W. Park, The University of Hong Kong
Linda M. Parsons, The University of Alabama
Dennis M. Patten, Illinois State University
Jeff L. Payne, University of Kentucky
Kenneth V. Peasnell, Lancaster University
Winnie Peng, Hong Kong University of Science and Technology
Mark C. Penno, The University of Iowa
Raynolde Pereira, University of Missouri–Columbia
Gary F. Peters, University of Arkansas
David Piercey, University of Massachusetts Amherst
Joel E. Pike, University of Illinois at Urbana–Champaign
Arianana S. Pinello, Georgia State University
Matthew L. Pinnuck, University of Melbourne
Jeffrey A. Pittman, Hong Kong University of Science and Technology
Mini J. Pizzini, Southern Methodist University
George A. Plesko, University of Connecticut
Elizabeth A. Plummer, Texas Christian University
Grace Pownall, Emory University
Douglas F. Prawitt, Brigham Young University
Gary John Previts, Case Western Reserve University

Dasaratha V. Rama, Florida International University
Ram T. S. Ramakrishnan, University of Illinois at Chicago
Krishnamoorthy [K.] Ramesh, Michigan State University
Frederick W. [Bill] Rankin, Colorado State University
Sue P. Ravenscroft, Iowa State University
Korok Ray, Georgetown University
Philip M. J. Reckers, Arizona State University
Lynn L. Rees, Texas A&M University
Sonja Olhoft Rego, The University of Iowa
Stefan Reichelstein, Stanford University
Kenneth Reichelt, Louisiana State University
Robert J. Resutek, Dartmouth College
J. Kenneth Reynolds, Indiana University
Shelley C. Rhoades-Catanach, Villanova University
Jay S. Rich, Illinois State University
Edward J. Riedl, Harvard University
Leslie A. Robinson, Dartmouth College
Jonathan L. Rogers, The University of Chicago
Brian R. Rountree, Rice University
Casey Rowe, Purdue University
Sugata Roychowdhury, Massachusetts Institute of Technology
Tjomme O. Rusticus, Northwestern University
Stephen G. Ryan, New York University
Floran Sabac, University of Alberta
Maria H. Sanchez, Rider University
Tatiana Sandino, University of Southern California
Richard C. Sansing, Dartmouth College
Richard Saouma, University of California, Los Angeles
Haresh Sapra, The University of Chicago
Jeffrey W. Schatzberg, The University of Arizona
Andrew P. Schmidt, Columbia University
Susan Scholz, The University of Kansas
Catherine M. Schrand, University of Pennsylvania
Joseph J. Schultz, Jr., Arizona State University
Rachel Schwartz, University of Illinois at Urbana–Champaign
Steven T. Schwartz, Binghamton University, SUNY
Lisa M. Sedor, The University of Washington
Dan Segal, University of Toronto
Partha Sengupta, George Mason University
Nicolas Seybert, The University of Texas at Austin
Douglas A. Shackelford, The University of North Carolina at Chapel Hill
Ron Shalev, Washington University at St. Louis
Philip B. Shane, University of Colorado at Boulder
Min Shen, George Mason University
Terry Shevlin, The University of Washington
Charles Shi, University of California, Irvine
Michael D. Shields, Michigan State University
Pervin K. Shroff, University of Minnesota
Stephanie A. Sikes, Duke University

Timothy Simin, The Pennsylvania State University
Paul J. Simko, University of Virginia
Roger Simnett, The University of New South Wales
Dan A. Simunic, University of British Columbia
David B. Smith, University of Nebraska–Lincoln
Michael J. Smith, Boston University
Steven D. Smith, University of Illinois at Urbana–Champaign
Naomi S. Soderstrom, University of Colorado at Boulder
Theodore Sougiannis, University of Illinois at Urbana–Champaign
Brian C. Spilker, Brigham Young University
Sri S. Sridhar, Northwestern University
Dhinu Srinivasan, University of Pittsburgh
Suraj Srinivasan, Harvard University
Anup Srivastava, Northwestern University
Paul John Steinbart, Arizona State University
Douglas E. Stevens, Florida State University
Donald J. Stokes, Monash University
Dan N. Stone, University of Kentucky
Roland Strausz, Humboldt University–Berlin
Stephan Stubben, The University of North Carolina at Chapel Hill
Jayanthi Sunder, Northwestern University
Shyam Sunder, Northwestern University
Edward P. Swanson, Texas A&M University
Wei [Vicki] Tang, Georgetown University
William B. Tayler, Emory University
Stephen Taylor, University of Technology Sydney
Siew-Hong Teoh, University of California, Irvine
Paul Tetlock, Columbia University
Jane Thayer, The University of Georgia
Daniel B. Thorton, Queen's University
Robert H. Trezevant, University of Southern California
Jennifer W. (Jenny) Tucker, University of Florida
Wim A. Van der Stede, London School of Economics
Ann Vanstraelen, Maastricht University
Mark E. Vargus, The University of Texas at Dallas
Uma K. Velury, University of Delaware
Ramgopal Venkataraman, Southern Methodist University
Shankar Venkataraman, Georgia Institute of Technology
Rodrigo Verdi, Massachusetts Institute of Technology
Robert E. Verrecchia, University of Pennsylvania
Cynthia C. Vines, University of Kentucky
James M. Wahlen, Indiana University
William S. Waller, The University of Arizona
Dechun Wang, Texas A&M University
Isabel Wang, Michigan State University
Shiing-Wu Wang, University of Southern California
Charles E. Wasley, University of Rochester
Susan G. Watts, Purdue University
Gregory B. Waymire, Emory University

Connie D. Weaver, Texas A&M University
Alan Webb, University of Waterloo
Dan Weiss, Tel Aviv University
Michael G. Welker, Queen's University
Stephen W. Wheeler, University of the Pacific
J. Scott Whisenant, University of Houston
Stacey M. Whitecotton, Arizona State University
O. Ray Whittington, DePaul University
Christine I. Wiedman, University of Waterloo
Matthew Wieland, The University of Georgia
T. Jeffrey Wilks, Brigham Young University
Michael Willenborg, University of Connecticut
David D. Williams, The Ohio State University
Michael G. Williamson, The University of Texas at Austin
Ryan Wilson, The University of Iowa
Wendy M. Wilson, Southern Methodist University
Regina Wittenberg-Moerman, The University of Chicago
Christopher J. Wolfe, Texas A&M University
Franco Wong, University of Toronto
Joanna S. Wu, University of Rochester
Anne Wyatt, University of Queensland
Hong Xie, University of Kentucky
Yanfeng Xue, The George Washington University
Robert J. Yetman, University of California, Davis
Ping Eric Yeung, The University of Georgia
Richard A. Young, The Ohio State University
Michael D. Yu, Washington State University
Yong Yu, The University of Texas at Austin
Tzachi Zach, The Ohio State University
Amy Zang, University of Rochester
Frank X. Zhang, Yale University
Guochang Zhang, Hong Kong University of Science and Technology
Ivy Xiying Zhang, University of Minnesota
Wei Zhang, University at Albany, SUNY
Yuan Zhang, Columbia University
Yue (May) Zhang, Northeastern University
Yun (Clement) Zhang, Duke University
Yijiang Zhao, University of Alaska Fairbanks
Amir Ziv, Columbia University

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EDITORIAL POLICY AND STYLE INFORMATION

EDITORIAL POLICY

According to the policies set by the Publications Committee (which were endorsed by the Executive Committee and were published in the *Accounting Education News*, June 1987), *The Accounting Review* "should be viewed as the premier journal for publishing articles reporting the results of accounting research and explaining and illustrating related research methodology. The scope of acceptable articles should embrace any research methodology and any accounting-related subject, as long as the articles meet the standards established for publication in the journal ... No special sections should be necessary. The primary, but not exclusive, audience should be—as it is now—academicians, graduate students, and others interested in accounting research."

The primary criterion for publication in *The Accounting Review* is the significance of the contribution an article makes to the literature. Topical areas of interest to the journal include accounting information systems, auditing and assurance services, financial accounting, management accounting, taxation, and all other areas of accounting, broadly defined. The journal is also open to all rigorous research methods.

The efficiency and effectiveness of the editorial review process is critically dependent upon the actions of both authors submitting papers and the reviewers. Authors accept the responsibility of preparing research papers at a level suitable for evaluation by independent reviewers. Such preparation, therefore, should include subjecting the manuscript to critique by colleagues and others and revising it accordingly prior to submission. The review process is not to be used as a means of obtaining feedback at early stages of developing the research.

Reviewers and editors are responsible for providing constructive and prompt evaluations of submitted research papers based on the significance of their contribution and on the rigor of analysis and presentation.

MANUSCRIPT PREPARATION AND STYLE

The Accounting Review's manuscript preparation guidelines follow *The Chicago Manual of Style* (15th ed.; University of Chicago Press). Another helpful guide to usage and style is *The Elements of Style*, by William Strunk, Jr., and E. B. White (Macmillan). Spelling follows *Webster's Collegiate Dictionary.*

FORMAT

1. All manuscripts should be formatted in 12-point font on 8 1/2 x 11" paper and should be double-spaced, except for indented quotations.
2. Manuscripts should be as concise as the subject and research method permit, generally not to exceed 7,000 words.
3. Margins should be at least one inch from top, bottom, and sides.
4. To promote anonymous review, authors should not identify themselves directly or indirectly in their papers or in experimental test instruments included with the submission. Single authors should not use the editorial "we."
5. A cover page should show the title of the paper, all authors' names, titles and affiliations, email addresses, and any acknowledgments.

Pagination: All pages, including tables, appendices and references, should be serially numbered. Major sections should be numbered in Roman numerals. Subsections should not be numbered.

Numbers: Spell out numbers from one to ten, except when used in tables and lists, and when used with mathematical, statistical, scientific, or technical units and quantities, such as distances, weights and measures. For example: *three days; 3 kilometers; 30 years.* All other numbers are expressed numerically.

Percentages and Decimal Fractions: In nontechnical copy use the word percent in the text.

Hyphens: Use a hyphen to join unit modifiers or to clarify usage. For example: *a cross-sectional equation; re-form.* See *Webster's* for correct usage.

Keywords: The abstract must be followed by at least three keywords to assist in indexing the paper and identifying qualified reviewers.

Data Availability: A line immediately following the Keyword identifiers should indicate whether the data are available (see "Data Availability" later in this statement).

ABSTRACT/INTRODUCTION

An Abstract of about 100 words (150 maximum) should be presented on a separate page immediately preceeding the text. The Abstract should concisely inform the reader of the manuscript's topic, its methods, and its findings. Keywords and the Data Availability statements should follow the Abstract. The text of the paper should start with a section labeled "I. Introduction," which provides more details about the paper's purpose, motivation, methodology, and findings. Both the Abstract and the Introduction should be relatively nontechnical, yet clear enough for an informed reader to understand the manuscript's contribution. The manuscript's title, but neither the author's name nor other identification designations, should appear on the Abstract page.

TABLES AND FIGURES

The author should note the following general requirements:

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Securities and Exchange Commission (SEC). 2002. *Certification of Disclosure in Companies' Quarterly and Annual Reports*. Release Nos. 33-8124, 34-46427. Washington, D.C.: SEC.

U.S. House of Representatives. 2002. The Sarbanes-Oxley Act of 2002. Public Law 107-204 [H. R. 3763]. Washington, D.C.: Government Printing Office.

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NOVEMBER 2009 PLACEMENT ADS

The deadline for free position ads to be included in this section is two months prior to the date of publication. *The Accounting Review* is published in January, March, May, July, September, and November. Position ads in the "Placement Ads" are free with the purchase of a job posting in the AAA Career Center. For more information on how to purchase a job posting in the Career Center and receive your free position ad in *The Accounting Review*, go to the AAA website at http://aaahq.org and click on "Career Center," or call our office at 941-921-7747.

601 UNIVERSITY OF WINDSOR, Odette School of Business invites applications for a tenure-track faculty position in the area of Accounting at the rank of Assistant or Associate Professor commencing as early as July 1, 2010 or later. For a detailed position description visit our website at: http://www.uwindsor.ca/facultypositions. Contact: Dr. Allan Conway, Dean, Odette School of Business, University of Windsor, 401 Sunset Ave., Windsor, Ontario N9B 3P4, Canada; Phone: (519) 253-3000, Ext. 3091; Fax: (519) 973-7073: Email: aconway@uwindsor.ca. For information on the University of Windsor or the City of Windsor, contact Dr. Janice Drakich, Director, Faculty Recruitment at (877) 665-6608 (toll free) within North America; call collect outside of North America at 001-519-561-1432 or email: recruit@uwindsor.ca.

602 WESTERN NEW ENGLAND COLLEGE invites applications for a tenure-track Assistant/Associate Professor accounting position to begin August 2010. Candidates are expected to hold a doctorate in accounting or anticipate having completed all degree requirements by the starting date. The successful candidate will demonstrate a strong commitment to teaching financial reporting, cost accounting, and/or auditing in the undergraduate and graduate programs and to scholarly research. Western New England College is a private, independent, coeducational institution founded in 1919 and located on an attractive 215-acre suburban campus in Springfield, Massachusetts within easy access of Boston and New York City. More information about the College is available at: http://www.wnec.edu. Send *vita*, teaching evaluations, research manuscript, and reference information to: Dr. Julie Siciliano, Dean, School of Business, Western New England College, 1215 Wilbraham Road, Springfield, MA 01119. Electronic submissions are encouraged and should be sent to: ajacque@wnec.edu. Western New England College is an Equal Opportunity Employer.

603 AMERICAN UNIVERSITY, Kogod School of Business invites applications and nominations for a tenure-track appointment in accounting at the rank of Assistant or Associate Professor, beginning Fall 2010, subject to budgetary approval. Applicants should have a Ph.D. in accounting or should anticipate completing the degree within a very short period following initial employment. Candidates must be effective teachers and should be strongly committed to excellence in scholarly research. We are particularly interested in candidates with teaching interests in the areas of managerial accounting, auditing/accounting information systems or taxation, but all fields will be considered. Responsibilities include undergraduate and master's-level teaching, active engagement in scholarly research, and participation in department, school, and university activities. Salary and benefits are competitive. Review of applications will begin immediately and will continue until the position is filled. Applications should be made in electronic format, via email at the address below. Please put ACCOUNTING TENURE-TRACK POSITION in the subject line of your email. Applications should include a letter of application, *curriculum vita*, three letters of recommendation, recent teaching evaluations, and copies of recent published papers or working papers. Please send to: Kogod Academic Affairs Coordinator, Kogod School of Business, Accounting Search Committee, 4400 Massachusetts Avenue, N.W. American University, Washington, D.C. 20016-8044: Phone: (202) 885-1963; Email: kogodfacultyapps@american.edu. American University is an Equal Opportunity/Affirmative Action Employer committed to a diverse faculty, staff, and student body. Women and minorities are strongly encouraged to apply.

604 UNIVERSITY OF CANTERBURY, Department of Accounting and Information Systems is currently inviting applications for a Lecturer in Accounting, full-time. We are interested in hearing from suitably qualified people who can demonstrate the potential to develop as outstanding teachers and researchers in any area of accounting or auditing. Ideally, candidates will have already published academic work and/or have completed, or substantially completed, a relevant postgraduate research degree. The Department is committed to equity and diversity and the successful candidate will have the opportunity to work with diverse groups of students studying for bachelor's, master's, and doctoral degrees and who come from around New Zealand and the Pacific Basin. We can offer a competitive remuneration package, and the position offers an excellent quality of life in Christchurch, New Zealand at a reasonable cost. Information about the Department can be found at: http://www.acis.canterbury.ac.nz/. For an informal discussion about the posts, please contact Richard Fisher, Head of the Accounting Group, at: Email: richard.fisher@canterbury.ac.nz; Phone: +64 3 364 2621; or Professor Amanda Ball, Head of Department, at: Email: amanda.ball@canterbury.ac.nz; Phone: +64 3 364 2613. Applications, quoting Reference No. A179-09S, should be submitted online by the closing date of August 16, 2009. A position description, together with further details about the group, department, college, and university, may be downloaded from our website: http://vacancies.canterbury.ac.nz. Queries regarding the application process should be emailed to: hr_bsec@canterbury.ac.nz.

605 WAKE FOREST UNIVERSITY, Schools of Business is seeking a qualified candidate for a Fall 2010 tenure-track appointment in accounting for an Assistant/Associate Professor of Accounting with opportunities to teach in our Winston-Salem undergraduate and graduate accounting programs and our Winston-Salem and Charlotte M.B.A. programs. Qualified candidates at all ranks and in all areas of accounting are welcome to apply. Experienced candidates should have a track record of excellence in teaching and research. The position offers a very competitive teaching load and package of compensation and benefits. Qualifications: Ph.D. or ABD with an anticipated completion date by Summer 2010. Application Procedure: Candidates should send an application letter, *vita*, and reference names to: The Accounting Faculty Search Committee, Wake Forest University, Schools of Business, PO Box 7285, Reynolda Station, Winston-Salem, NC 27109-7285; Email (preferred) to: Ms. Helen Baucom at: baucomhh@wfu.edu. EOE/AA.

606 PURDUE UNIVERSITY CALUMET (PUC) invites applications for a tenure-track Assistant Professor of Accounting position effective August 2010, budget permitting. Doctoral degree in discipline is preferred/ABDs in advanced stages of completion will be considered. Responsibilities may include teaching undergraduate and graduate courses in Auditing, Fraud Accounting, Managerial Accounting, and other advanced accounting topics, scholarly research leading to refereed publications, service to the profession, the university, and the community. The School of Management offers a Master of Accountancy, the M.B.A., and Baccalaureate degrees. PUC is located in Hammond, IN, 25 miles southeast of downtown Chicago. PUC provides a superb benefits package. Interested applicants should submit a letter of application, transcripts, and *vita* with references to: Dr. Paul McGrath, Accounting Search Committee, School of Management, Purdue University Calumet, 2200 169th Street, Hammond, IN 46323. Electronic submissions are encouraged at: pmcgrat@calumet.purdue.edu. Purdue University Calumet is an Equal Access/Equal Opportunity/Affirmative Action Employer, fully committed to a diverse workplace.

607 PACE UNIVERSITY, Lubin School of Business invites applications for a full-time tenure-track position in financial accounting, at the Assistant or Associate level, starting Fall 2010. A successful candidate for this position must reflect the School's commitment to excellence in teaching and scholarly research. A Ph.D. is required and practical experience is beneficial. The Lubin School offers an extensive array of undergraduate, graduate, and post-graduate programs on campuses in New York City and Westchester County. The Accounting Department is fully accredited by the AACSB, the International Association for Management Education. Our salary and benefit package is competitive. Email resume to Dr. Rudy Jacob (rjacob@pace.edu), or to Dr. Samir ElGazzar (selgazzar@pace.edu.). Pace University is an Affirmative Action/Equal Opportunity Employer.

608 WHU—Otto Beisheim School of Management is a leading German business school. It is consistently placed among the top schools in national rankings and, with its Kellogg-WHU E.M.B.A. program, WHU is ranked #12 worldwide in the international *Financial Times* ranking. As part of its growth strategy, WHU will establish an Assistant Professorship of Management Accounting and Control, as of November 2009 (or later). The position is research-oriented and part of the Institute of Management Accounting and Control (IMC). The Assistant Professor is expected to work closely together with the two chairs and other Assistant Professors in the field of management accounting and control. The appointment is initially on a fixed-term basis of three years, but can be extended by up to another three years. The Assistant Professor is also expected to teach in the different WHU programs. Lectures are held in English. Candidates for the position should hold a Ph.D./doctoral degree. Applications from abroad are welcome. Applications with *cv* and other relevant information should be sent by September 15, 2009 to Professor Dr. Michael Frenkel, Dean of WHU—Otto Beisheim School of Management, Burgplatz 2, D 56179 Vallendar, Germany. For general information consult: http://www.whu.edu/controlling. For more information about the position, prospective candidates may contact Prof. Dr. Utz Schäffer (utz.schaeffer@whu.edu) or Prof. Dr. Dr. h.c. Jürgen Weber (jweber@whu.edu).

609 APPALACHIAN STATE UNIVERSITY invites applications for a tenure-track position for Fall 2010 to teach undergraduate and graduate courses. All discipline areas and levels will be considered, subject to funding. Candidates should have earned their Ph.D. (or be ABD) in accounting and have demonstrated potential for quality teaching and research. Instructional duties will include student advisement and curriculum development and may include online instruction and/or instruction at off-campus sites. Faculty members are expected to maintain an active program of scholarship and participate in service activities. Complete applications must include a letter of application, current *curriculum vita*, and a list of three or more references. Review of applications will begin on September 1, 2009 and will continue until the position is filled. Send applications to: Dr. Tim Forsyth, Chairperson, Department of Accounting, ASU PO Box 32013, Appalachian State University, Boone, NC 28608. Appalachian is an Equal Opportunity Employer.

610 VILLANOVA UNIVERSITY, Villanova School of Business invites applications for a tenure-track faculty position at the Assistant or Associate Professor level beginning Fall 2010 with a primary need in Financial Accounting. Qualifications include outstanding research potential and excellence in teaching along with a doctorate in Accounting. Villanova University is a Catholic University of the Augustinian tradition located on a picturesque campus in the suburban main line area of Philadelphia. The undergraduate program (#11 rank) as well as several graduate programs are nationally ranked by *BusinessWeek*. Salary, benefits, and support are competitive with AACSB-accredited schools. Send a cover letter and *vitae* that includes the names of three references to: Search Committee, C/O James Bierstaker, Accounting and IS Department, Villanova School of Business, Villanova University, Villanova, PA 19085; or Email: james.bierstaker@villanova.edu. Recommendation letters are needed for campus visits, which will begin in Fall and continue until the position is filled. Application materials will be shared with department faculty. Villanova University is an Equal Opportunity Employer and encourages applications from minority group members and women.

611 EASTERN ILLINOIS UNIVERSITY invites applicants for a nine-month tenure-track position at the Assistant or Associate level in Accountancy. Position begins Fall 2010. Candidate should possess expertise and teaching experience in either Financial or Managerial, although other specialties will be considered. A Ph.D. or D.B.A. is preferred, although ABDs close to completion will be considered. Candidates should demonstrate a teaching, research, and service record commensurate with the desired professional rank. Evidence of strong instructional effectiveness and scholarly productivity is essential, as are strong communication and interpersonal skills. Business experience and professional certification are desirable. Eastern Illinois University, a public university, places priority on teaching excellence for a student body in a residential setting. EIU is consistently named one of the top midwestern public universities in our class by *U.S. News & World Report*. Approximately 12,000 students are enrolled in undergraduate and graduate programs. Charleston is located in east central Illinois and combines the benefits of a community of 20,000 with access to several large cities, including Chicago, St. Louis, and Indianapolis. EIU offers the Bachelor's of Science in Business with Accountancy and Masters of Business Administration with Accountancy concentration degrees. The School of Business and the Accountancy Program are fully accredited by AACSB International. There are approximately 1,300 declared undergraduate business majors and 100 M.B.A. degree candidates. Applicants should submit electronically the following materials: (1) application letter, (2) *curriculum vitae*, and (3) names and contact information for three references to: Dr. Hank Davis, Director of Accountancy, at: busrecrt@eiu.edu (with "Accounting Position Application" in the subject line). Finalists will be asked to provide transcripts. Review of applications will begin on August 17, 2009. Only online applications will be accepted. For more information about the School of Business and the university, visit: http://www.eiu.edu/~business/facultystaff/employment.php. Eastern Illinois University is an Equal Opportunity/Equal Access/Affirmative Action Employer committed to achieving a diverse community.

612 UNIVERSITY OF OREGON, Lundquist College of Business seeks to fill two anticipated tenure-track positions in Accounting, at the Assistant, Associate, or Professor of Accounting level, subject to funding availability, effective September 2010. Duties: publishing economics-based research in top academic journals, teaching undergraduate and graduate accounting courses, and supervising Ph.D. students. Requires the ability to work effectively with students, faculty, and staff from diverse backgrounds. Requirements: Assistant level: Completed or nearly completed Ph.D. plus demonstrated potential for teaching & research excellence; Associate/Professor level: Completed Ph.D., demonstrated superior teaching competence, record of scholarly publications in *TAR*, *JAR*, *JAE*, *CAR*, or comparable journals. Appointment with tenure requires formal review. Salary competitive. For full description go to: http://hr.uoregon.edu/jobs/Application review begins January 15, 2010; continues until position filled. Application: Send letter of interest, *curriculum vitae*, copies of research papers, evidence of teaching performance, and three letters of reference to: ActgOpenSearch@lcbmail.uoregon.edu. The University of Oregon is an AA/EO/ADA institution committed to cultural diversity.

613 UNIVERSITY OF WISCONSIN–LA CROSSE, College of Business, which is AACSB-accredited, invites applications for two tenure-track accounting positions in its Department of Accountancy starting August 2010. Requests for January 2010 or 2011 start dates will be considered. Candidates seeking the rank of Assistant or Associate Professor should posses a Ph.D. or D.B.A. in Accounting (or a related discipline). ABDs will be considered at the Instructor level until completion of the degree. Preference given to candidates with primary specialization in Assurance Services or Financial Accounting, with other areas seriously considered. Professional certification highly desirable. These positions offer an array of resources for professional development. The college values continuing self-development in teaching, scholarship, and service consistent with AACSB standards. Review of applications will begin September 1, 2009 and continue until positions are filled. For additional information about this position and to apply, please visit: https://employment.uwlax.edu/applicants/jsp/shared/frameset/Frameset.jsp?time=1240494358073. UW–La Crosse is an Equal Opportunity Employer committed to increasing the diversity of its workforce.

614 ROCHESTER INSTITUTE OF TECHNOLOGY, E. Philip Saunders College of Business invites applications for two tenure-track faculty positions at the Assistant or Associate level in Accounting. Candidates should hold a Ph.D. or D.B.A. from an AACSB-accredited institution or equivalent. Responsibilities include teaching graduate and undergraduate accounting courses. Area is open, but preference for one position will be given to candidates qualified to teach Accounting Information Systems and Auditing. Responsibilities include teaching graduate and undergraduate courses and publishing high-quality scholarly accounting research. Candidates for Associate Professor must have a proven record of success in teaching and research. Professional experience and professional certification in accounting are also preferred, and a willingness to interact with the business community is highly desirable. The Saunders College values collegial individuals who are excellent communicators, innovative teachers, and active researchers. The College works closely with the business community, which provides research and professional opportunities. Apply online at: http://mycareer.rit.edu. Reference IRC#29897. Please submit your cover letter detailing your technical, teaching and scholarship qualifications and achievements, a *curriculum vitae*, and the names, titles, addresses, phone numbers, and email addresses for three references. We are seeking individuals who are committed to contributing to RIT's core values, honor code, and statement of diversity. The Rochester Institute of Technology is an Equal Opportunity/Affirmative Action Employer. All individuals with the ability to contribute in meaningful ways to the university's continuing commitment to cultural diversity, pluralism, and individual differences are encouraged to apply.

615 TENNESSEE TECH UNIVERSITY seeks an Assistant or Associate Professor of Accounting for a nine-month, tenure-track appointment. Doctorate or ABD nearing completion in Accounting and a willingness to teach both on-ground and online accounting courses. To be considered, candidate must submit a letter of application, resume, copies of complete college transcripts (official transcripts required upon hire), complete TTU faculty application form, and three letters of reference to: Dr. Richard Rand, Search Committee Chair, Box 5024, Tennessee Tech University, Cookeville, TN; Website: http://www.tntech.edu/jobs. Screening will begin 1 September 2009. Position open until filled. AA/EEO.

616 BOISE STATE UNIVERSITY, Department of Accountancy invites interested applicants for the position of Assistant or Associate Professor to become a part of our team to continue our quest toward becoming a Metropolitan Research University of Distinction. This is a tenure-track managerial accounting faculty position for either a new Ph.D. or someone with experience at a previous institution of higher education whose interests are in teaching and conducting research in the managerial accounting area. At a minimum you should have a Ph.D. in business with an accounting emphasis. The preferred candidate will have a professional certification (e.g. CPA, CMA, CIA, or other). If interested in this position, please submit a letter of application indicating your interest and qualifications for this position. Attach a *cv* that includes employment history (including dates of employment) and three professional references with contact information. Application materials should be emailed to: denglish@boisestate.edu; or mailed to: Dr. Denise M. English, Chair and Professor, 0006-89 Department of Accountancy, College of Business and Economics, Boise State University, 1910 University Dr., Boise, ID 83725-1610. Review of applications will begin immediately and will continue until December 31, 2009. Boise State University offers a new workload policy for Professors aimed to give them more flexibility. Read more about this at: http://chronicle.com/weekly/v54/i45/45b02401.htm. Read about the University at: http://www.boisestate.edu. Read about the City of Boise at: http://www.boisechamber.org.

617 UNIVERSITY OF DALLAS is accepting applications for tenure-track positions as Assistant/Associate Professor of Accounting. Candidates should send a letter of interest clearly indicating a preference between a primary teaching responsibility at the undergraduate- or graduate-level and preference for a start date of Spring, Summer, or Fall 2010, a *curriculum vita* detailing all academic and professional experience, plus the names, addresses, telephone numbers, and email contact information for three references electronically to: faculty@gsm.udallas.edu.

618 OAKLAND UNIVERSITY, School of Business Administration in Rochester, Michigan, an AACSB-accounting-accredited program, invites applications for several tenure-track positions (subject to budget approval) at the Assistant level in Accounting, beginning August 15, 2009 or later. An interest in audit, accounting information systems, or managerial accounting is desirable but all research and teaching areas will be considered. Scholarly work is supported and expected. A Ph.D. or advanced ABD in accounting or equivalent from an AACSB-accredited program required. Please send a cover letter, *cv*, and arrange to send three letters of recommendation to: Chair, Accounting Faculty Search Committee, Department of Accounting and Finance, School of Business Administration, Oakland University, 2200 N. Squirrel Rd., Rochester, MI 48309; Email: shafer@oakland.edu. Visit the SBA website: http://www.sba.oakland.edu. Oakland University is an Equal Opportunity Employer.

619 UNIVERSITY OF KANSAS, School of Business seeks applicants for one or more accounting tenure-track or tenured positions in the Accounting and Information Systems Area, beginning August 2010. We are interested in candidates with the ability to teach financial, audit and/or tax. Research endeavors should be focused on publication in the most highly regarded journals. Candidates for a tenured position should have a record of achievement in teaching and research to warrant such an appointment, evidence of an ongoing, high-quality research program and the experience, interest, and ability to work with doctoral students. Candidates for a tenure-track position should have evidence of high-quality research and teaching accomplishment and/or potential. A Ph.D., D.B.A., or other doctorate in accounting or a closely related field must be completed by the appointment date. Rank and compensation are competitive and commensurate with qualifications. The Accounting program offers degrees at the bachelor's, master's, and doctoral levels. For additional information about the School and its faculty and programs, see: http://www.business.ku.edu/. Applications should include a letter of interest, a *cv*, example(s) of scholarly work, and the names and contact information for at least three references. Submit applications online at: https://jobs.ku.edu. Search for position #00001355. KU is an Equal Opportunity/Affirmative Action Employer. The University encourages applications from underrepresented group members.

620 MCMASTER UNIVERSITY, DeGroote School of Business at invites applications for a tenure-track position in Accounting and Financial Management Services Area, at the Assistant or Associate Professor level, beginning July 1, 2010. This candidate should have a Ph.D. degree in the accounting field and preferably a professional accounting designation. Duties include research, teaching undergraduate students in the Commerce programs and graduate students in the M.B.A. program, and working with Ph.D. students. Salary will be commensurate with academic qualifications, research and teaching accomplishments, and practical experience. Applications should include a *curriculum vita*, statements of research and teaching, and the names and contact information of three references. Send applications and all supporting documentation to: Y. L. Chan, Chair Accounting and Financial Management Services Area, DeGroote School of Business, McMaster University, 1280 Main St. W., Hamilton, ON L8S 4M4, Canada; Email: ylchan@mcmaster.ca; Fax: (905) 521-8995. All qualified candidates are encouraged to apply; however, Canadians and Permanent Residents will be given priority. McMaster University is strongly committed to employment equity within its community, and to recruiting a diverse faculty and staff. The University encourages applications from all qualified candidates, including women, members of visible minorities, Aboriginal persons, members of sexual minorities, and persons with disabilities. Applications will be considered until the position is filled.

621 CREIGHTON UNIVERSITY seeks an excellent teacher at the Assistant/Associate Professor of Accounting level for undergraduate and M.B.A. classes in the areas of financial accounting or information systems control environment with a secondary interest in auditing. Quality research is required, as well as service to the University and accounting community. Creighton is a Catholic, Jesuit University in a vibrant, growing metropolitan area of Omaha, Nebraska. Standard teaching load is nine credit hours per semester. In the Jesuit tradition, we provide a value-centered, quality accounting education to prepare our students to excel in careers in accounting and business and to become leaders in their profession, in their organizations, and in their communities. For information about the Accounting Department, the College and the University, visit: http://creighton.edu. Position Available: August 2010. Contact: Dr. Thomas A. Shimerda, College of Business Administration, Department of Accounting, Creighton University, 2500 California Plaza, Omaha, NE 68178; Phone: (402) 280-2615; Email: tshimerda@creighton.edu. AA/EOE.

622 ROGER WILLIAMS UNIVERSITY, Gabelli School of Business invites applications for a tenure-track position in accounting at the rank of Assistant or Associate Professor, beginning Fall 2010. Responsibilities include teaching three courses in accounting per semester. The individual hired will be expected to advise students and maintain a high level of professional activity through quality research and service. The ideal candidate will have teaching specialties in two or more of the following areas: cost, information systems, international, forensic. Minimum qualifications include candidacy (ABD) for the Ph.D./D.B.A. in accounting from an AACSB-accredited institution. A professional certification (CPA and/or CMA) and professional experience in public accounting are assets. The ideal candidate will have an established record or strong potential for high-quality innovative instruction, publishable research, and service to the University and community. A completed application consists of a letter of interest, *curriculum vitae*/resume, and the names and contact information of at least three references. Applications should be submitted to: Chair of the Search Committee-Accounting (Ref #FAC10-001), Gabelli School of Business, Dean's Office, Roger Williams University, One Old Ferry Road, Bristol, RI 02809-2921. Electronic submissions are encouraged: vbertolino@rwu.edu. Applications may also be sent via surface mail.

623 BERRY COLLEGE, Campbell School of Business, AACSB-accredited, seeks to fill a tenure-track faculty position, rank open, in Accounting beginning August 2010. Candidates should have an earned doctorate in Accounting, be excellent teachers, and have an established research agenda with refereed publications. Teaching responsibilities include undergraduate auditing and introductory accounting. Service responsibilities include undergraduate advising. Rank and salary will be commensurate with credentials and experience. Berry College is a comprehensive liberal arts college in northwest Georgia with enrollment of approximately 1,900 undergraduates. Applicants should send a letter of application, current *vita*, evidence of current teaching effectiveness and scholarship, and three letters of recommendation to: Accounting Search, Office of the Dean, Campbell School of Business, Berry College, PO Box 495024, Mount Berry, GA 30149-5024. Screening begins October 1, 2009, and will continue until the position is filled. Berry College is an Equal Opportunity Employer. For ADA accommodations please contact our ADA Coordinator, VTTY 706-236-1722.

624 STONEHILL COLLEGE, Business Administration Department seeks applicants for a tenure-track position in Accounting to begin in August 2010, at either the Assistant or Associate level. The ideal candidate will hold a Ph.D. or D.B.A. in Accounting with a strong interest in teaching and scholarship and will teach a variety of courses, including Advanced Accounting and Cost/Managerial Accounting. Preference will be given to candidates with professional certification, previous work background in either public accounting or corporate accounting, and prior teaching experience. ABDs must have made substantial progress toward completion of the dissertation to be considered. The Department offers rigorous and challenging pre-professional training to talented students, and operates as a Department of Business within a liberal arts environment. We are in candidacy for AACSB accreditation, and thus seek an individual with a commitment to academically qualified status. Salary is competitive. Stonehill is a selective Catholic college located near Boston on a beautiful 384-acre campus in Easton, Massachusetts. With a student-faculty ratio of 13:1, the College engages 2,350 students in 72 rigorous academic programs in the liberal arts, sciences, and pre-professional fields. The Stonehill community helps students to develop the knowledge, skills, and character to meet their professional goals and to live lives of purpose and integrity. Many Minds. One Purpose. Qualified candidates should submit a letter of interest, a current *cv*, and the names and phone numbers of three references electronically to: Carolyn McGuinness, Administrative Assistant, Department of Business Administration; Email: cmcguinness@stonehill.edu. Applicants who will enrich the diversity of the campus community are strongly encouraged to apply.

625 TOWSON UNIVERSITY has tenure-track positions available at the Assistant Professor level for Fall 2009 or 2010. A visiting Professor position may also be available. Competence in auditing is desired. Applicants should possess a Ph.D./D.B.A. in accounting, or a Ph.D./D.B.A. in a related area with professional certification in accounting. Applicants must also provide evidence of teaching effectiveness and research productivity or potential. ABDs will be considered if completion is expected within the first year of appointment. The teaching load is nine credit hours per semester. Review of applications will begin immediately. Towson University is AACSB-accredited in business and accounting, and jointly offers M.B.A. and M.S. in Accounting programs with the University of Baltimore. Please submit an application, *vitae*, official transcripts and three letters of reference to: Dr. Andrew Schiff, Recruitment Chair, Department of Accounting, Stephens Hall, Room 102, Towson University, 8000 York Road, Towson, MD 21252-0001; or Email: aschiff@towson.edu.

626 ALABAMA STATE UNIVERSITY, College of Business Administration (COBA) invites applications for Director of the Master of Accountancy Program. Preference will be given to candidates applying at the level of Associate Professor although applications are welcomed at all levels. The position is available beginning Fall 2009. Salary is competitive and commensurate with experience. Successful candidates will have a Ph.D. or D.B.A. in Accounting from a regionally accredited institution. Business accreditation from AACSB and/or ACBSP. ABDs will be considered if close to completion. Applicants must have excellent communication skills and relevant teaching experience. Experienced applicants are expected to display a strong research record; recent Ph.D.s, D.B.A.s and ABDs must demonstrate potential for research productivity. Contact Dr. Gow-Cheng Huang at: ghuang@alasu.edu.

627 ALABAMA STATE UNIVERSITY, College of Business Administration (COBA) invites applications for two full-time positions in accounting with a focus on financial accounting and auditing. Preference will be given to candidates applying at the level of Assistant Professor although applications are welcomed at all levels. The positions are available beginning Fall 2009 and are subject to final budget approval by the President of the University. The College of Business Administration is accredited by ACBSP, enrolls approximately 1,000 students, and has programs at both the undergraduate and graduate levels. The University is located in Montgomery, Alabama. Qualifications: Successful candidates will have a Ph.D. or D.B.A. in Accounting from a regionally accredited institution. Applicants with degrees from AACSB- and ACBSP-accredited universities are preferred. ABDs will be given consideration if close to completion. Applicants must have excellent communication skills and relevant teaching experience. Experienced applicants are expected to display a strong research record; recent Ph.D.s, D.B.A.s and ABDs must demonstrate potential for research productivity. Full-time Accounting and Finance Department faculty members teach at both the undergraduate and the Master of Accountancy level. Contact Jorja Bradford at: jbradford@alasu.edu. For more information about Alabama State University, please visit our website at http://www.alasu.edu.

628 CALIFORNIA STATE UNIVERSITY, EAST BAY seeks applications for two full-time tenure-track positions: department chair and tenure-track accounting faculty. The Department of Accounting and Finance offers undergraduate and graduate coursework in different areas of business including: Accounting, Finance, Real Estate, and Taxation. Date of appointment: 2010. Application deadline: Review of applications will begin July 1, 2009. Please submit a letter of application, which addresses the qualifications noted in the position announcement; a complete and current *vita*; graduate transcripts; copies of major publications; and three letters of recommendation to: Dr. Terri Swartz, Dean, c/o Kathy Dulkie College of Business and Economics, California State University, East Bay, 25800 Carlos Bee Boulevard, Hayward, CA 94542; Phone: (510) 885-3291; Fax: (510) 885-4352; Email Address: Kathy.dulkie@csueastbay.edu. For details of each position see http://www.csueastbay.edu/OAA/CBEjob.htm/#ACCT. California State University, East Bay is an Equal Opportunity Employer and hires only individuals lawfully authorized to work in the United States.

629 GONZAGA UNIVERSITY, School of Business Administration seeks applications for one faculty position, with strong emphasis in taxation although all areas will be considered. Starting date: September 2010. Position: Assistant or Associate Professor, to develop and teach courses in both undergraduate and graduate programs. Qualifications: Ph.D. at or near completion, or J.D. Professional certification and experience desired. Preference will be given to candidates who have demonstrated evidence of teaching effectiveness and aptitude for scholarly research. Salary: Commensurate with experience, AACSB competitive. Gonzaga University is a private liberal arts institution with approximately 6,000 students (4,400 undergraduates), recognized by *U.S. News & World Report* as among the top regional universities in the West. There are approximately 1,100 undergraduate and 250 graduate students enrolled in the business school, with 25 percent to 30 percent of these students in the accounting program. Gonzaga accounting students have consistently performed well on the CPA exam, achieving a first-time pass rate well in excess of the national average. Gonzaga's accounting students are heavily recruited by CPA firms and industry. Gonzaga's educational mission is set in the Jesuit tradition with emphasis on the moral and ethical implications of learning, living, and working within today's global societies. The School of Business Administration is AACSB-accredited at both the undergraduate and graduate levels, and offers B.B.A., M.B.A., and M.Acc. degrees. In addition, the accounting program is currently in the self-study year for separate accounting accreditation. The School is housed in a recently expanded and technologically up-to-date 60,000 sqft building along the Spokane River, in the midst of Gonzaga's beautifully landscaped 115-acre campus. Gonzaga University is a Jesuit, Catholic, humanistic institution, and is therefore interested in candidates who will contribute to its distinctive mission. Spokane, located in eastern Washington, has a metropolitan population of approximately 500,000. The local business community actively supports the educational and research activities conducted by Gonzaga. In addition to the usual urban attractions of a city its size, Spokane offers much in the way of outdoor recreation. There are more than 100 lakes and six ski resorts within a 100-mile radius of Spokane. Send application letter and resume to: Dr. Gary Weber; Email: weber@gonzaga.edu. Gonzaga University is an AA/EEO employer committed to diversity.

630 FURMAN UNIVERSITY, Department of Business and Accounting is seeking candidates to fill a tenure-track position. Candidates should have a primary teaching interest in auditing and related areas, and also have the ability and desire to teach introductory courses. The candidate should have a Ph.D., or similar terminal degree, in accounting or a related field. Furman is a highly selective, independent, top 40 undergraduate liberal arts institution with an enrollment of approximately 2600 students. The university is located in the vibrant and beautiful upstate region of South Carolina, offers generous benefits to fulltime faculty, and subscribes to a problem-solving, project-oriented, experience-based approach to education that is referred to as Engaged Learning. The Department of Business and Accounting confers the B.A. degree with a major in either Business Administration or Accounting. The position requires teaching excellence, a program of scholarly and professional activity, effective institutional service, and an ability to work with colleagues across disciplines. Applicants will be considered at all levels and should send both a resume and letter describing their educational philosophies to: Sandy Roberson, Department of Business and Accounting, Furman University, 3300 Poinsett Highway, Greenville, SC 29613; Email: sandy.roberson@furman.edu. Review of applications will continue until the position is filled. Furman University is an Affirmative Action/Equal Opportunity Employer.

631 UNIVERSITY AT ALBANY, SUNY, Department of Accounting invites applications for one tenure-track position at the Assistant/Associate Professor level starting September 2010, subject to budgetary approval and available funds. The candidates should have a doctoral degree or be ABD in Accounting. While all areas will be considered, candidates with strong research and teaching interests in Auditing, Assurance, and/or Forensic-related areas are particularly desired. Evidence of a strong commitment to scholarly research and excellence in teaching, and a demonstrated ability to work with and/or instruct diverse groups of people is required. CPA and/or professional experience is highly desirable. Candidates are requested to submit their *vitae* and contacts for three references by email to: Ingrid E. Fisher, Accounting Search Chair, Department of Accounting & Law, School of Business, University at Albany, SUNY, Albany, NY 12222; Email: ifisher@uamail.albany.edu. Review of applications will begin immediately and continue until the position is filled. The University at Albany is an EEO/AA/IRCA/ADA employer.

632 UNIVERSITY OF MASSACHUSETTS LOWELL, College of Management invites applications for a tenure-track position in the field of Accounting at the rank of Full/Associate/Assistant Professor. Candidates will have an earned Ph.D. or D.B.A. in Accounting from an AACSB-accredited institution by the position starting date (January or September 2010); a demonstrated record of, or at the Assistant level a strong potential for, high-quality research; a demonstrated record of high-quality instruction in some combination of Financial/Managerial Accounting, AIS, Auditing, or Taxes, at both the M.B.A. and undergraduate levels; excellent interpersonal skills and the ability to speak and write English clearly; and the ability to work with a diverse student and faculty population. NOTE:' Strong consideration will be given to candidates with public accounting or corporate experience, preferably with applicable certifications (e.g., CPA, CMA, etc.). Applicants should apply online at: http://jobs.uml.edu. Attach: (1) a statement of professional interests and goals, (2) *curriculum vitae*, (3) samples of research work, (4) evidence of teaching effectiveness, if available. Applications will be accepted until the position is filled. Rank is open and salary is competitive. This position is contingent upon funding.

633 UNIVERSITY OF GEORGIA, J.M. Tull School of Accounting is seeking applications for one anticipated tenure-track position in Accounting (an Assistant or Associate Professor with a teaching interest in financial accounting). The anticipated date of appointment for the position is Fall 2010. Candidates for this position should have either a Ph.D. in Accounting or be well along in the dissertation stage. Applicants must have a commitment to excellence in teaching and scholarship. Salary and benefits are competitive. Applications received before October 1, 2009 are assured of consideration. Please submit application materials (current *curriculum vitae* and dissertation proposal or example of scholarly work) to: Professor Ben Ayers, J.M. Tull School of Accounting, Terry College of Business, 255 Brooks Hall, University of Georgia, Athens, GA 30602. The University of Georgia is an Equal Opportunity/Affirmative Action Institution.

634 YOUNGSTOWN STATE UNIVERSITY is seeking applicants for one or more tenure-track positions in accounting at the Assistant or Associate Professor levels starting in August 2010 or January 2011. Applicants should have a primary teaching interest in AIS, Tax, or Cost/Managerial, but we will consider all qualified candidates. Review of applications will begin immediately and will continue until positions are filled. The successful applicant must be academically qualified (AQ) for AACSB-accreditation purposes, with a doctorate in accounting from an AACSB-accredited institution preferred. Applicants who are in the final stages of the dissertation process will be considered. Other requirements include a commitment to teaching excellence, demonstrated ability to do publishable research in relevant peer-reviewed journals, service to the university and community, a commitment to accounting education, and evidence of strong communication and interpersonal skills. Professional certification is preferred. Qualified candidates should send a letter of application, current *vitae*, three letters of reference, a statement of teaching qualifications, and copies of teaching evaluation summaries (if available) to: Dr. David E. Stout, Accounting Search Committee Chair, Williamson College of Business Administration, Youngstown State University, Youngstown, OH 44555-0001. Materials may also be sent to: destout@ysu.edu. Visit: http://www.ysu.edu. AA/EOE.

635 UNIVERSITY OF SOUTH CAROLINA, School of Accounting invites applications for one or more tenure-track positions open at all ranks beginning in Fall 2010. Candidates should have a primary teaching interest in Managerial Accounting, Financial Accounting, Financial Statement Analysis, or Auditing, and must possess a doctorate or expect to complete their doctorate by August 2010. In addition to being committed to excellent teaching, applicants must be ambitious and motivated researchers. Salaries are competitive and commensurate with experience and achievements. Submit *curriculum vitae* and working papers, or a defended dissertation proposal if at the dissertation stage, to: Professor Al Leitch, Moore School of Business, University of South Carolina, Columbia, SC 29208; Email: leitch@moore.sc.edu. The University of South Carolina is an AA/EEO employer. Minorities and women are strongly encouraged to apply. The University of South Carolina does not discriminate in educational or employment opportunities or decisions for qualified persons on the basis of race, color, religion, sex, national origin, age, disability, sexual orientation, or veteran status.

636 DARTMOUTH COLLEGE, Tuck School of Business's graduate school of management, anticipates faculty searches in accounting during the 2009–2010 academic year. We are open to all levels of appointment—Assistant, Associate, or Full Professor—and we will be recruiting at the new-Ph.D. level. We are interested in candidates who will produce research of excellent quality that will have high impact on the field. There must be evidence that the candidate can conduct research and teach at a level of quality consistent with Tuck's high standards. Faculty applications and all supporting documents must be submitted by email to: faculty.recruiting@tuck.dartmouth.edu. Specify in the subject line of the email that you are applying for an accounting position. Dartmouth College is an Equal Opportunity/Affirmative Action employer. Women and minorities are encouraged to apply.

637 UNIVERSITY OF MINNESOTA, Carlson School of Management invites applications for a tenure-track position in accounting; rank depending upon qualifications and experience, and consistent with Carlson School and University policy. All applicants must possess a doctoral degree in accounting or a related field (or be close to completion), and must have a strong commitment to accounting research and teaching. Applicants for an Associate or Full position must have demonstrated excellence in teaching and an established record of publications in top-tier academic journals commensurate with the rank they are seeking. Review of applications begins immediately and will continue until the position is filled. Applications should include a *curriculum vita*, samples of recent research papers, evidence of teaching quality, and two letters of reference. In addition, applicants will be required to apply online at: https://employment.umn.edu, and search for posting #161843 (for Assistant Professor) or posting #161842 (for tenured Associate or Full Professor). Applications should be sent to: Recruiting Chair, Department of Accounting, 3-122 Carlson School of Management, 321 19th Avenue South, Minneapolis, MN 55455. The University of Minnesota is an Equal Opportunity Educator and Employer.

638 HOFSTRA UNIVERSITY, Frank G. Zarb School of Business, Department of Accounting, Taxation, and Legal Studies in Business invites applications for an anticipated tenure-track position in the graduate program in taxation at the Assistant, Associate or Full Professor level beginning Spring or Fall 2010. The candidate will be expected to teach 18 semester hours per annum. Candidates must hold either a Ph.D. in Business from an AACSB-accredited program with a tax or accounting concentration, or a J.D./L.L.M. with a taxation concentration. Please send a letter of interest, *curriculum vitae*, evidence of teaching excellence and scholarly work, and the addresses and telephone numbers of three references to: Dr. Nathan Slavin, Chair Department of Accounting, Taxation, and Legal Studies in Business at: Nathan.S.Slavin@Hofstra.edu. Hofstra University is an Equal Opportunity Employer, committed to fostering diversity in its faculty, administrative staff and student body, and encourages applications from the entire spectrum of a diverse community.

639 SUNY AT GENESEO is an extraordinary college and seeks an individual with a passion and talent for teaching, a capacity for mission-appropriate scholarship, and the wit and willingness to perform useful service. We invite applications for a full-time, tenure-track Assistant Professor position in Accounting beginning Fall 2010. Applicants should possess relevant training and credentials in either Managerial Accounting or Auditing, and must hold a Ph.D. in Accounting or expect completion by the time of appointment. For application instructions and additional details of this employment offer see: https://jobs.geneseo.edu. Our departmental secretary (Beth Fitzpatrick; Email: fitzpat@geneseo.edu; Phone: (58) 245-5367) stands ready to assist you. Applicants should arrange for academic transcripts and three recent letters of recommendation to be sent directly to: Michael D. Schinski, Interim Dean, School of Business, South Hall 113, SUNY at Geneseo, One College Circle, Geneseo, NY 14454. Review will continue until the position is filled.

640 BROCK UNIVERSITY invites applications for two tenure-track positions in Accounting starting July 2010. Candidates must possess a doctorate in accounting or a related discipline (completed or near completion) and demonstrate potential for excellence in teaching and research in any area of accounting. Brock's Faculty of Business is AACSB-accredited and offers competitive salaries, research support, low teaching loads, low student/faculty ratios, and modern facilities. The Accounting Department has 24 full-time faculty, offering three graduate and two undergraduate programs. Brock is located in the scenic Niagara peninsula close to New York State and Toronto. Applications (preferably electronic) should include a cover letter, *curriculum vitae*, research paper or approved dissertation proposal, teaching evaluations, and three reference letters sent directly from the referee. Please submit to: Dr. Jingyu Li, Chair Accounting Department, Brock University, St. Catharines, Ontario L2S 3A1 CANADA; Phone: (905) 688-5550, ext. 5599; Email: jennifer.li@brocku.ca. For more details, refer to the advertisement at: http://www.brocku.ca/hr/careers/position_detail.php?id=660

641 UNIVERSITY OF UTAH, School of Accounting invites applications for new tenure-track faculty position in Accounting at the Assistant or Associate rank in any area, with a preference for Cost/Managerial beginning Fall 2010; pending funding and University approval. Applicants should possess a doctorate by Fall 2010. The School of Accounting and the David Eccles School of Business are accredited by the AACSB. Application due by January 15, 2010 or until position is filled. Please include working paper, *vita*, evidence of teaching effectiveness, and three letters of reference to: Martha Eining, Director, School of Accounting, 1645 E Campus Center Dr., Room 108, University of Utah, Salt Lake City, Utah 84112. The University of Utah values candidates with experience working with students from diverse backgrounds, and who possess a demonstrated commitment to improving access to higher education for historically underrepresented students. The University of Utah, an Equal Opportunity/Affirmative Action Employer, encourages applications from women and minorities, and provides reasonable accommodation to the known disabilities of applicants/employees.

642 UNIVERSITY OF ARKANSAS is a nationally competitive, student-centered, research university serving Arkansas and the world. The Department of Accounting in the Sam M. Walton College of Business seeks an Assistant/Associate Professor (tenure-track position) beginning August 2010 and will consider all teaching interests. Candidates for Assistant/Associate Professor should have a Ph.D. in accounting, outstanding research potential, and a strong commitment to excellence in graduate and undergraduate teaching. This position is contingent on funding. The city of Fayetteville is located in the northwest corner of the state and is a city of approximately 70,000 with a regional population of more than 400,000. The region boasts one of the highest growth rates and is consistently listed among the most desirable places to live in the U.S. A number of *Fortune* 500 companies are headquartered in Northwest Arkansas, including Wal-Mart, Tyson, and J.B. Hunt. Interested candidates should send: (1) a current *vitae*; (2) evidence of teaching effectiveness; (3) copies of research working papers; and (4) letters of reference or the name, address, telephone number, and email address of at least three references to: Linda Myers, Department of Accounting, WCOB 401, Sam M. Walton College of Business, One University of Arkansas, Fayetteville, AR 72701. For more information contact Dr. Myers at: lmyers@walton.uark.edu. The University of Arkansas is an Equal Opportunity/Affirmative Action Employer. All applicants are subject to public disclosure under the Arkansas Freedom of Information Act and persons hired must have proof of legal authority to work in the United States.

643 UNIVERSITY OF CALIFORNIA, LOS ANGELES invites applications for positions available July 2010 in Financial, Managerial, and Tax Accounting at all academic ranks. A Ph.D. or expected completion is required by June 30, 2011. Demonstrated ability or potential for high-quality research and teaching are important. Applications at the untenured level should include a cover letter, *curriculum vitae*, letters of recommendation, recent publications or working papers and a job market paper. Applications must be mailed by January 15, 2010 to: Professor David Aboody, UCLA Anderson School of Management, Accounting Department, Rm. D412, Box 951481, Los Angeles, CA 90095-1481. Under Federal law, the University of California may employ only individuals who are legally authorized to work in the United States as established by providing documents specified in the Immigration Reform and Control Act of 1986. The University of California is an Equal Opportunity/Affirmative Action Employer. The department has a strong commitment to the achievement of excellence and diversity among its faculty and staff.

644 BOSTON COLLEGE, Carroll School of Management seeks applicants for two tenure-track faculty positions in the Department of Accounting for Fall 2010. Applicants must be willing to teach managerial accounting and/or auditing. Applicants for a senior position must demonstrate a record of teaching excellence and publishing at the very best journals (*TAR*, *JAR*, *JAE*, *CAR*; *RAS*, *AOS*, or comparable journals). Applicants for a junior position must demonstrate an interest in and ability to do high-quality accounting research and the potential for excellence in teaching at both the undergraduate and graduate levels. We seek individuals with openness to diverse intellectual interests and an appreciation for Boston College's Jesuit and liberal arts traditions. We offer a collegial environment and an energetic faculty with close ties to Boston and national financial and academic communities. Applicants should send a *curriculum vitae*, examples of written work, three letters of reference and evidence of teaching effectiveness to: Billy Soo, Department Chairperson; Email: billy.soo@bc.edu. Applications received by September 30, 2009 for senior positions and by February 1, 2010 for junior positions will receive full consideration. The Carroll School of Management is an Equal Opportunity Employer.

645 UNIVERSITY OF NOTRE DAME, Department of Accountancy invites applications for position openings at the Assistant and Associate Professor levels beginning Fall 2010. All research areas will be considered. Applicants for Assistant Professor positions should expect to complete doctoral degree requirements before the start of the contract period. All candidates should have a strong commitment to scholarly research and excellence in teaching. Salary is very competitive and research support is excellent. Please send *curriculum vita*, three letters of recommendation, and an example of scholarly work to: Professor Fred Mittelstaedt, Chairman, Department of Accountancy, 102 Mendoza College of Business, University of Notre Dame, Notre Dame, IN 46556. The University is located adjacent to the city of South Bend, Indiana, approximately 90 miles southeast of Chicago. For more information about the University of Notre Dame, the Mendoza College of Business, and the Department of Accountancy please visit the department's website at: http://www.nd.edu/~acctdept. The University of Notre Dame, an Equal Opportunity Employer with a strong institutional and academic commitment to diversity, endeavors to foster a vibrant learning community animated by the Catholic intellectual tradition.

646 UNIVERSITY OF NOTRE DAME, Department of Accountancy, invites applicants for a non-tenure-track faculty teaching appointment beginning spring or Fall 2010. The successful candidate will teach and coordinate sections of the department's two introductory accounting courses. An ideal candidate would hold a Ph.D. in Accounting and possess a strong commitment to teaching. Applications should include a *curriculum vita*, three letters of recommendation, and evidence of excellent teaching performance and curriculum development. Please send all materials to: Professor Fred Mittelstaedt, Chairman, Department of Accountancy, 102 Mendoza College of Business, University of Notre Dame, Notre Dame, IN 46556. The University is located adjacent to the city of South Bend, Indiana, approximately 90 miles southeast of Chicago. For more information about the University of Notre Dame, the Mendoza College of Business, and the Department of Accountancy please visit the department's website at: http://www.nd.edu/~acctdept. The University of Notre Dame, an Equal Opportunity Employer with a strong institutional and academic commitment to diversity, endeavors to foster a vibrant learning community animated by the Catholic intellectual tradition.

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STANFORD UNIVERSITY
GRADUATE SCHOOL OF BUSINESS

Faculty Positions in Accounting

STANFORD UNIVERSITY, Graduate School of Business, invites applications for tenured and non-tenured faculty positions in Accounting, effective September 2010, from candidates at all levels and stages of their careers who are interested in managerial accounting, financial accounting, tax and other areas. Candidates must have a PhD and the highest level of accomplishment or promise in both scholarly research and MBA and PhD teaching. Applications should include CV and copies of research publications.

Applicants are strongly encouraged to submit their applications electronically by visiting the web site http://www.gsb.stanford.edu/recruiting and uploading their curriculum vitae, research papers and publications, and teaching evaluations, if applicable, on that site. Alternatively, all materials may be sent by e-mail to Faculty_Recruiter@GSB.Stanford.Edu, or by postal mail (non-returnable) to Office of Faculty Recruiting, Box A, Graduate School of Business, Stanford University, 518 Memorial Way, Stanford, CA 94305-5015. However, submissions via e-mail and postal mail can take 4-6 weeks for processing. For an application to be considered complete, all applicants must have three letters of recommendation emailed to the preceding email address, or sent via postal mail. The application deadline is January 24, 2010.

Stanford University is an equal opportunity employer and is committed to increasing the diversity of its faculty. It welcomes nominations of and applications from women and minority groups, as well as others who would bring additional dimensions to the University's research, teaching and clinical missions.

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- Tax law and financial law publications from noted sources such as the American Bar Association and American Law Institute
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h. Total *(Sum of 15f and g)* ▶			4,392	4,332
i. Percent Paid *(15c divided by 15f times 100)* ▶			99%	99%

16. Publication of Statement of Ownership

☒ If the publication is a general publication, publication of this statement is required. Will be printed in the November 2009 issue of this publication.

☐ Publication not required.

17. Signature and Title of Editor, Publisher, Business Manager, or Owner	Date
Roland LaTulip Roland LaTulip Director of Finance and Administration	9/25/09

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